TO STUDY THE PATTERN AND OUTCOME OF THE ILEAL PERFORATIONS

A THESIS SUBMITTED TO BABA FARID UNIVERSITY OF

HEALTH SCIENCES, FARIDKOT (PUNJAB)

IN THE PARTIAL FULFILLMENT

FOR THE AWARD OF DEGREE OF

MASTER OF SURGERY

IN

GENERAL SURGERY

(MAY, 2023)

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I hereby declare that the thesis entitled **"TO STUDY THE PATTERN AND OUTCOME OF THE ILEAL PERFORATIONS"** submitted towards partial fulfillment of the requirements for the award of **MS GENERAL SURGERY** degree to BFUHS is a compilation of original work carried out by me under the supervision of **Dr. Chiranjiv Singh Gill,** Professor, Department of General Surgery, **Dr. Ravinder Pal Singh**, Professor, Department of General Surgery. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated

to

my family

&

Teachers

LIST OF ABBREVIATIONS

AIDS:	Acquired immunodeficiency syndrome
APACHE:	Acute Physiology and Chronic Health Evaluation
ASA:	American Society of Anesthesiologists
CSF:	Cerebrospinal fluid
CT:	Computerized tomography
DNA:	Deoxyribonucleic acid
ELISA:	Enzyme-linked immunosorbent assay
G.I.T:	Gastrointestinal tract
MRI:	Magnetic resonance imaging
NEC:	Necrotizing enterocolitis
NSAIDs:	Non-steroidal anti-inflammatory drugs
QoL:	Quality of life
RBC:	Red Blood Corpuscle
RLQ:	Right lower quadrant
SEAP:	Surveillance of Enteric Fever in Asia Project
SIRS:	Systemic inflammatory response syndrome
SLE:	Systemic lupus erythematosus
TIP:	Typhoid intestinal perforation
TNF:	Tumor necrosis factor

ABSTRACT

Background: Hollow viscus perforation leading to peritonitis is one of the commonest emergency surgeries conducted in a surgical practice for a case of acute abdomen. Among the perforation of the bowel, ileal perforation especially is a serious complication. Best surgical management remains controversial. Hence; under the light of above-mentioned data, the present study was conducted for assessing the pattern and outcome of the ileal perforations.

Objective: To study the mortality and morbidity of ileal perforation among patients with early and delayed presentation.

Material and methods: A total 60 patients were enrolled for the present study. A Performa was made and complete medical history was recorded separately. Clinical examination of all the patients was carried out. Based on the clinical history, etiologic spectrum of all the patients was established. Detailed description of the ileal perforation was recorded separately.

Results: Mean age of the patients with ileal perforation was 43.03 years; 71.67 percent of the patients were males while the remaining were females. Typhoid was the chief etiologic factor responsible for ileal perforation, found to be present in 48.33 percent of the patients. Tuberculosis and traumatic cause of ileal perforation was seen in 20 percent and 16.67 percent of the patients respectively. Loop ileostomy was done in 58.33 percent of the patients while simple closure of perforation and resection-anastomosis was done in 16.67 percent and 25 percent of the patients respectively. Mortality was seen in 6.67 percent of the patients while post-surgical complications were seen in 26.67 percent of the patients. Mortality rate was significant higher among patients of late presentation group 21.4% in comparison to patients of early presentation group 2.2 %

Conclusions: The ileal perforation is commonly seen in third and fourth decade of life with high male preponderance. The risk of surgical site infection is high in these cases and proper preventive measures must be taken for that.Mortality rate was significant higher among patients of late presentation.

Key words: Small intestine, Ileal perforation peritonitis and exploratory laparotomy.

ACKNOWLEDGEMENT

I would like to acknowledge and give my warmest thanks to my supervisor ***Dr. Chiranjiv Singh Gill*** *and my co-supervisor* ***Dr. Ravinder Pal Singh*** *who made this work possible. Their guidance and advice carried me through all the stages of writing my thesis.*

I would also like to thank my committee members for letting my defense be an enjoyable moment, and for your brilliant comments and suggestions, thanks to you.

I'd like to thanks Dr. Tanya Bhalla and my batch mates for their assistance throughout my research. I'd like to express my gratitude to everyone. Thanks to their generosity and encouragement.

I would also like to give special thanks to my parents, my wife Dr. Ishita Sharma and my family as a whole for their continuous support and understanding when undertaking my research and writing my project. Your prayer for me was what sustained me this far.

Finally, I would like to thank God, for letting me through all the difficulties. I have experienced your guidance day by day. You are the one who let me finish my degree. I will keep on trusting you for my future.

Dr. Deepak Kumar

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KEY TO MASTER CHART

ICJ	-	ILEO-CAECAL JUNCTION
HTN	-	HYPERTENSION
TB	-	TUBERCULOSIS
LOOP ILEOS	-	LOOP ILEOSTOMY
RESECTION- ANAS	-	RESECTION AND ANASTMOSIS
ABD PAIN	-	ABDOMINAL PAIN

INTRODUCTION

Hollow viscus perforation leading to peritonitis is one of the commonest emergency surgeries conducted in a surgical practice for a case of acute abdomen. It is the second most common cause for acute abdomen following appendicitis. Perforation as a cause of acute abdomen accounts for 30-40% of the total cases of acute abdomen presenting to a surgical emergency. Among the cases of hollow viscus perforation duodenal and gastric perforations are the commonest accounting to almost 60- 80 % in some series, followed by ileal, appendicular and large bowel. The incidence of perforation is on the rise due to the increased prevalence of gastritis in the population and also due to the increased use of over-the-counter NSAIDs which abolish the gastro-protective effects of prostaglandins.[1]

Among the perforation of the bowel, ileal perforation especially is a serious complication. It is of significance because of its association with high mortality and morbidity as it occurs mostly in developing countries in places where medical facilities may not be readily available. Perforation of terminal ileum is a cause for obscure peritonitis, heralded by exacerbation of abdominal pain associated with tenderness, rigidity and guarding, most pronounced over right iliac fossa. However, for many patients in a severe toxic state, there may be obscure clinical features with resultant delays in diagnosis and prompt surgical intervention.[2,3]

The incidence of Ileal perforation is also increasing mainly due to increased number of people presenting to the emergency department and also due to better diagnosis and improved reporting of cases. Ileal perforations account for about 20 % of all cases of hollow viscus perforation. Among the causes for Ileal perforations, typhoid Ileal

perforations are the commonest followed by tubercular and other etiologies.[3,4]

A “non-specific” etiology is attributed to ileal perforations when the perforation cannot be classified on the basis of clinical symptoms, gross examination, serology, culture and histopathological examination into any disease state such as enteric fever, tuberculosis or malignancy. These ulcers are usually single and commonly involve terminal ileum. It has been proposed that submucous vascular embolism, chronic ischemia due to atheromatous vascular disease or arteritis, or drugs such as enteric coated potassium tablets are responsible for them. Apart from enteric fever and “non-specific” ulcers other causes in western countries include Crohn's disease, Behcet's disease, radiation enteritis, adhesions, ischemic enteritis, SLE and very rarely intestinal tuberculosis.[4,5]

The importance of a thorough history and physical cannot be overstated and is usually sufficient to ascertain the etiology of the ileal perforation. Almost all patients experience some element of abdominal pain, and this is usually accompanied by nausea, vomiting, decreased bowel function, or fever.[6,7] Details about the symptoms including the length of time, prior episodes, recent procedures and exacerbating and relieving factors can be crucial in determining the cause of the ileal perforation. A family history of cancer and a personal history of colonoscopy can be important to determine the likelihood of occult cancer or inflammatory bowel disease.[8,9]

At the time of the initial evaluation, vital signs should be promptly assessed. These can show signs of SIRS or septic shock, and an urgent need for resuscitation and treatment may be warranted.[6,7] On physical examination, it is important to visually inspect the abdomen for surgical scars, visible hernias or injuries, and distension. Palpation of the abdomen

usually elicits discomfort and may yield peritoneal signs which are commonly present with perforation, peritonitis, or localized abscess.[9,10]

There are multiple imaging modalities and laboratory tests that can be useful to identify the presence and etiology of perforation. Abdominal and upright chest x-rays are quick and cheap and can identify even small amounts of pneumoperitoneum. Evidence of small and large bowel obstructions can also be visualized. CT of the abdomen and pelvis, however, is the most sensitive and specific test to diagnose a perforation and ascertain the most likely etiology. Disease processes such as diverticulitis, appendicitis, and bowel obstructions can be readily identified on CT. The use of intravenous contrast is recommended to aid in visualizing potential areas of ischemia. Complications from a perforation such as an abscess and secondary bowel obstruction can also be identified with CT and guide management accordingly.[6,9,10]

In children, the preferred primary test is ultrasound given its ease and lack of radiation exposure. If necessary, secondary testing such as x-ray, MRI, and CT are reasonable options.[9]

Non-operative treatment has been proposed in the past in moribund patients or for long-standing perforations, but there is now uniform agreement that the ultimate treatment for intestinal perforation should be a surgical one, although the best surgical management remains controversial. Actually, the type of surgical technique might have limited influence on the outcome that is likely more related to the preoperative clinical conditions of the patients, to the degree of abdominal contamination and to the quality of pre- and post-operative care.[11,12]

The type of the surgical procedure does not appear to influence the mortality of ileal perforation; conversely, sound surgical judgment and

experience are required to select the appropriate surgery according to the surgical findings and especially in advanced diseases.[11,12]

Primary repair is usually performed for single or isolated perforations by single or two suture layers. Segmental resection and anastomosis are preferred in presence of multiple adjacent perforations, while wedge resection is reported infrequently. Simple repair has generally a lower mortality rate than resection, although death rate remains high when abdominal contamination is severe.[12,13] The correlation between a high number of perforations, perhaps due to a highly virulent causative organism, and a poor surgical outcome is questionable. Enterocutaneous fistula is the most alarming complication, with a mortality up to 67% that is likely underestimated because death can occur months after surgery.[14,15]

Ileostomy is usually reserved to patients with severe disease, delayed presentation and very contaminated abdomen, with a high risk of suture leakage. Ileostomy has been also described as a routine primary procedure although it is associated with high morbidity rate and complications like prolapse, stricture, retraction, parastomal hernia, mainly when performed in patients with critical conditions. Moreover, loss of intestinal fluids from ileostomy can be managed with difficulty in austere environment and shortage of suitable ileostomy bags, with consequent skin damage around ileostomies, not rarely induces the patient to a self-limitation of food intake.[12,15]

Though ileostomy is a lifesaving procedure in such cases, it may result in significant number of complications as well. A small intestinal diverting stoma carries significant morbidity, mostly due to fluid/electrolyte imbalance and nutritional depletion. Peristomal skin irritation is perhaps the commonest complication of ileostomy leading to skin excoriation. Other complications after ileostomy are bleeding, ischemia, obstruction,

prolapse, retraction, stenosis, para-stomal herniation, fistula formation, residual abscess, wound infection, and incisional hernia. In addition, ileostomy is known to adversely affect the quality of life due to physical restrictions and psychological problems.[5]

Delayed primary closure of the abdominal wall has been recommended for heavily contaminated wounds since a long time, but to date the optimal method of closure in such situations remains controversial. Vacuum assisted closure appears promising but may not be feasible in peripheral facilities. Scheduled re-laparotomies, allowing early recognition of complications and a more appropriate cleaning the abdominal cavity, have been performed with a positive impact on survival.[12,15]

Although the mortality rates due to perforation has largely come down owing to an early diagnosis and treatment, the morbidity resulting from the condition and concomitant surgery still remains high. Hence; under the light of above-mentioned data, the present study was conducted for assessing the pattern and outcome of the ileal perforations.

AIM AND OBJECTIVES

To study the pattern and outcome of the ileal perforations in terms of mortality and morbidity.

Objectives

To study the mortality and morbidity of ileal perforation among patients with early and delayed presentation.

REVIEW OF LITERATURE

Ileal perforation is one of the commonest surgical emergency encountered in a day to day practice. Its history goes back to the period of SUSHRUTHA where perforation of intestines by sharp objects, fish bones and thorns has been described. There was also available a record of perforated intestines being drawn out and the severed edges were held close by the large black ants with their jaws prior to the clipping of the bodies of ants,following which the bowel was put inside and abdomen closed.[13]

In 1776 William Cullen was the one to coin the term PERITONITIS. The first successful closure of perforated intestine was performed by BENJAMIN TRAVERS. The introduction of LEMPERT SUTURES had begun a new era in restoring the perforated bowel integrity. The term TYPHUS (gr.cloudy) was first used by Hippocrates in 460 B.C.[14], [15] The term typhoidea was first used by Louis in 1829 and about 150 cases with splenomegaly, rose spots, fever,intestinal perforation, cervical lymphadenopathy were described by him. In 1973 Budd explained a theory of faeco oral transmission of the disease.[16,17]

1880 - Discovery of typhoid bacilli by Karl Joseph Ebereth

1884 - Isolation & culture of Salmonella typhi by Gaffkey

1896 - Test for agglutination detection in serum of typhoid patients by Widal.

First typhoid vaccine in humans was introduced by Pfeiffer and Kalle[17]

ANATOMY

The small intestine is a crucial component of the digestive system that allows for the breakdown and absorption of important nutrients that

permits the body to function at its peak performance. The small intestine accomplishes this via a complex network of blood vessels, nerves, and muscles that work together to achieve this task. It is a massive organ that has an average length of 3 to 5 meters. It divides into the duodenum, jejunum, and ileum.

- The duodenum is the shortest section, on average measuring from 20 cm to 25 cm in length. Its proximal end is connected to the antrum of the stomach, separated by the pylorus, and the distal end blends into the beginning of the jejunum. The duodenum surrounds the pancreas, in the shape of a "C" and receives chyme from the stomach, pancreatic enzymes, and bile from the liver; this is the only part of the small intestines where Brunner's glands are present on histology.
- The jejunum is roughly 2.5 meters in length, contains plicae circulares (muscular flaps), and villi to absorb the products of digestion.
- The ileum is the final portion of the small intestine, measuring around 3 meters, and ends at the cecum. It absorbs any final nutrients, with major absorptive products being vitamin B12 and bile acids.[18]

ILEUM

The ileum is the third and final part of the small intestine. Located mainly in the right lower quadrant (RLQ) of the abdomen, the ileum is the longest section of the small intestine. The ileum is thinner, with more narrow walls and fewer blood vessels. Food spends most of the time in the ileum. Within the ileum, segmentation slows, and peristalsis takes over. The ileocecal valve separates the ileum from the large intestine (colon). Hormones and nerves signal the valve to open and close, allowing food to

pass while keeping bacteria out. Special immune cells, Paneth cells, line the ileum to protect against bacteria. The ileum is the site of vitamin B12 and bile salt absorption.

Both the jejunum and ileum are innervated by the superior mesenteric plexus, a continuation of the lower portion of the celiac plexus, with the sympathetic innervation being the greater and lesser splanchnic nerves, while the parasympathetic innervation is the vagus nerve.[19]

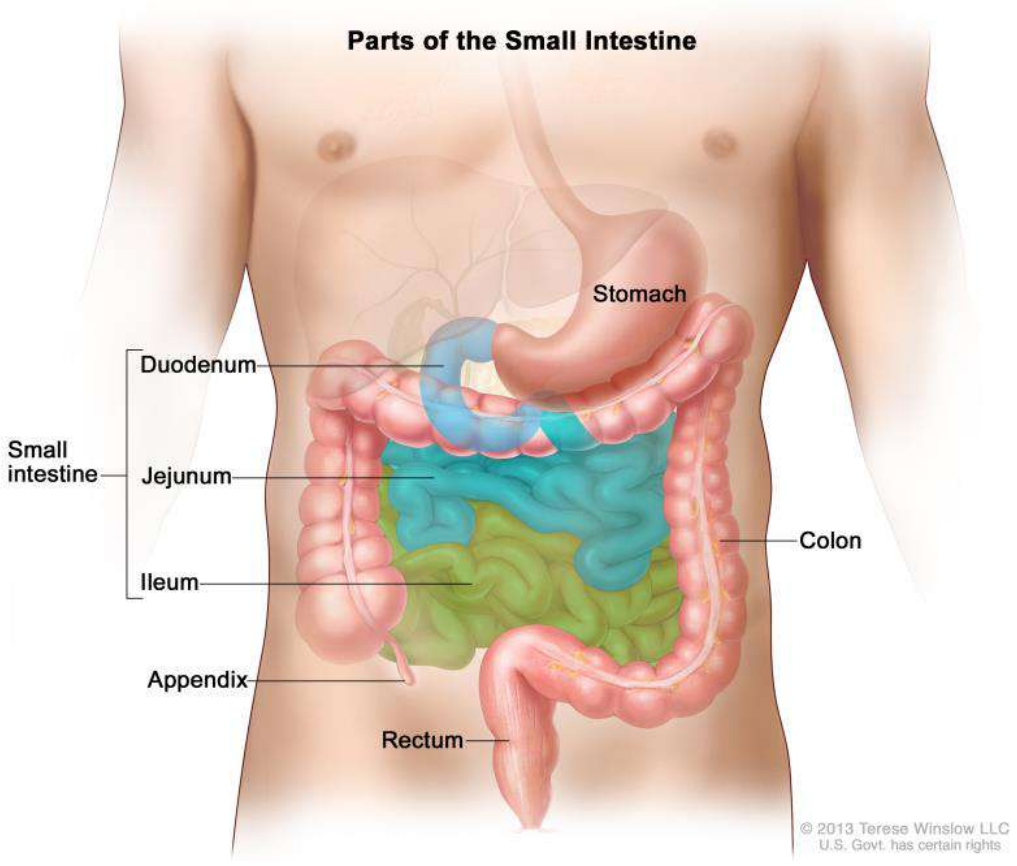


Figure (i): Parts of small intestine[20]

Features differentiating jejunum from ileum are as follows[21,22]

FEATURE	JEJUNUM	ILEUM
Vasa recta	Longer , straight	Shorter with more arterial arcades
Diameter	Larger	Smaller
Colour	Pink	Pale
Wall thickness	Thicker	Thinner
Fatty mesentery	Less	More
Speciality	Plica circularis or valvulae conniventes	Paeyer‟s patches

BLOOD SUPPLY[21,23]

The blood supply, as well as fat and lymphatics, resides within the Mesentry.The blood supply of the jejunum and ileum is derived from the Superior mesenteric artery, which has an extensive anastomosis (the vasa recta) adjacent to the mesenteric border of the bowel named the marginal artery. This artery travels along the entire length of the bowel. Near the ileal branch of the ileocolic artery, this artery breaks up into the anastomotic network of the vasa recta which increases in its complexity. Venous drainage follows the course of the arteries.

LYMPHATIC DRAINAGE

Lymphatic drainage occurs through the lymphatic vessels travelling parallel to the corresponding arteries. This lymph drains through the mesenteric lymph nodes into the cisterna chyli, then through the thoracic duct, and ultimately drains into the left subclavian vein.[22]

This lymphatic drainage constitutes a major route for the transport of absorbed lipid into the systemic circulation and likewise plays a major

pathway in immune defense mechanism and also in the spread of metastasis of tumor cells from the carcinomas of small bowel.[23]

NERVE SUPPLY

The innervation is provided by both sympathetic and parasympathetic divisions of the autonomic nervous system . Parasympathetic innervation is derived from the vagus . They traverse the celiac ganglion and synapse in the submucosal (Meissner's) and myenteric (Auerbach's) plexus.The myenteric plexus is responsible for the basal electrical activity of the gut. Stimulation of the parasympathetic system prepares for the activity of intestine by increasing blood flow, contractility, and its secretions.

The sympathetic fibers are from three sets of splanchnic nerves and their ganglion cells being situated usually in a plexus which is around the base of the superior mesenteric artery. Motor impulses affect the gut secretion and motility. Afferents from the intestine is carried through the general visceral afferent fibers of the sympathetic nervous system.[21-23]

HISTOLOGY[21-23]

The wall of small intestine is made up of 4 distinct layers ,

- Mucosa
- Submucosa
- Muscularis propria
- Serosa

SEROSA

It is the outermost layer of the small intestine consisting of visceral peritoneum, which is a single layer of flattened mesoepithelial cells encircling the jejunoileum, and anterior surface of the duodenum.

MUSCULARIS PROPRIA

The muscularis propria has two muscle layers, an outer thin longitudinal layer, and a inner thicker circular layer of smooth muscles. Ganglion cells from the myenteric (Auerbach) plexus are being scattered between these two muscle layers and send nerve fibers into both layers, thus permitting conduction through the muscle layer.

SUBMUCOSA

It has a layer of fibroelastic connective tissue which contains blood vessels and nerve fibres. It is the strongest component of the bowel wall and therefore should be included in anastomotic sutures. It contains extensive networks of lymphatics, arterioles, and venules and plexus of nerve fibers and ganglion cells (Meissner plexus). The nerve fibres from the mucosa & submucosa muscle layers are interconnected by small nerves, and cross connections between cholinergic and adrenergic elements have been evaluated.[21-23]

MUCOSA

It is divided into three layers:

- Muscularis mucosa
- Lamina propria
- Epithelial layer

The muscularis mucosa is a thin muscle layer separating the mucosa from the submucosa.The lamina propria is a layer of connective tissue between the epithelium and the muscularis mucosa containing plasma cells, mast cells, eosinophils ,lymphocytes,macrophages, fibroblasts, smooth muscle cells, and noncellular connective tissue. These plasma cells synthesize immunoglobulins. Other immune cells in the lamina propria release

various inflammatory mediators (e.g., cytokines, histamines and arachidonic acid metabolites) that modulates various cellular functions of the overlying epithelium. The epithelial layer is a continuous sheet of epithelial cells covering the villi and the crypts. The functions of the crypt epithelium are cell renewal and endocrine, exocrine, water, and ion secretion. The functions of the villus epithelium are absorption and digestion.

Four main cell types are found in the mucosal layer:

- Goblet cells secreting mucus
- Paneth cells secreting lysozyme, tumor necrosis factor (TNF), and the cryptidins.
- Absorptive enterocytes
- Enteroendocrine cells produce the gastrointestinal hormones.

AETIOLOGY[24]

Ileal perforation is a serious and common complication of many systemic illness. According to literature, in developed countries the common causes are

- Foreign bodies
- Crohns
- Drugs
- Radiotherapy
- Congenital malformations
- Malignancies
- Diverticula
- Ischemic enteritis
- Non specific

Karmakar et al, the causes of ileal perforation were as follows.[24]

Typhoid	17
Non specific	7
Round worm	2
Meckels	1
TB	1
Trauma	2
Total	30

The results of the Karmakar et al study can be summarised as follows: Most common cause -- Typhoid followed by perforation due to non-specific. Nil case reported due to malignancy.

Indian study by Karmakar and Bhalerao et al.

Nonspecific	18
Typhoid	8
TB	3
Trauma	3
Diverticulitis	2

In the study by Karmakar and Bhalerao et al: Non specific> Typhoid[25]

Series by Kim JP et al reported that[26]

Typhoid	49
Non-specific	21
Obstruction	5
TB	3
Radiation enteritis	1

In their study, Typhoid > Non-specific perforation

Hence overall the common cause of ileal perforation in tropics ----

TYPHOID FEVER

TYPHOID PERFORATION: INCIDENCE

The documented rate of enteric perforation ranges from 0.5% to 78.6%.[27-29]

The causative organism of typhoid fever is SALMONELLA TYPHI , a gram negative bacillus. The bacillus passes through the peyers patches and multiplies in the reticuloendothelial system for about 10-14 days. The onset of clinical symptoms correlate with the seeding of the organism into the blood stream. After 14 days ie 2 weeks the bacillus reaches the gut via the blood stream and localises in the peyers patches. Ulceration and necrotic mesenteric lymphadenitis occurs which in course of time leading on to perforation of peyer‟s patches commonly encountered in the 2 nd week of the onset of illness.[24, 27- 29]

MACROSCOPY

The most consistent feature is a mesenteric lymphadenopathy. Longitudinal ulcers which are characteristic of enteric perforation are seen in the terminal part of the ileum and caecum. The diameter of the perforations varies between 5-8 mm. Hadley in his study found a large number of perforations less than 5mm.[30]

MICROSCOPY

There will be both local and systemic marked proliferation of the lymphoid follicles of reticuloendothelial cells. There also occurs accumulation of mononuclear cells and these macrophages are found as aggregates of small nodules filled in the center with red blood cells which is commonly referred to as Erythrophagocytosis. Rarely typhoid bacilli may also be seen within the aggregates.[30,31]

CLINICAL FEATURES

The symptoms of typhoid fever include fever , G.I. symptoms , respiratory symptoms, headache. Signs like rose spots , splenomegaly , and relative bradycardia. If untreated or there is a delay in diagnosis the patients can enter into the stage of complications like intestinal perforation, pneumonia, cholecystitis, myocarditis, bleeding. Vomiting, sudden worsening of abdominal pain, and distensionwarnsthe onsetofperforation. These signs and symptoms will be masked in a toxic patient making a delay in diagnosis.[27,28]

DIAGNOSIS

In endemic areas diagnosis of typhoid fever is mainly centered around clinical suspicion.[29] The diagnosis of complication like intestinal perforation can be made out by the presence of free gas under the diaphragm, pneumoperitoneum, pus in abdominal paracentesis and peritoneal lavage to detect pus or bile.[30,31]

The laboratory diagnosis of typhoid fever is usually by blood culture in the first week, serology by widal test in the second week, stool & urine culture in the third and fourth week of illness respectively.[32,33]

SEROLOGY

Widal test being the most commonly performed test which tend to measure the capsular and flagellar antibodies against the antigens of S. typhi & S. paratyphi. the test is positive between 7–10 days of onset of illness. In endemic regions this test is of limited value. Rising titres are considered significant esp. four fold rise in titres have a higher positive predictive value of diagnosing this fever. Patients with history of typhoid fever could have a transient rise in titres which is unrelated to fever is mainly due to the anamnestic response.[34]

CULTURE OF ORGANISM

The specimens like blood , urine, stool , and bone marrow aspirate can be used to isolate the organism. In the absence of illness blood culture positivity can be seen in about 80% during the first week of illness which decreases to about 25% in the consequent weeks. By the third week of illness about in 75% of the patients stool cultures show a positive result which were previously negative in the first week. Duodenal aspirates, biopsy from rose spots , sputum ,pus in suppurative lesions, CSF constitute the various other sources of culture.[34,35]

HISTOPATHOLOGY

The presence of mononuclear macrophage cells and RBC s within the phagocytes (Erythrophagocytosis) confirms the diagnosis of enteric fever. [34,35]

NEWER DIAGNOSTIC MODES

Nowadays several newer diagnostic modes have reached the labs. Some of them are Indirect fluorescent Vi antibody, Indirect hemagglutination, ELISA which have higher sensitivity and specificity than widal test.Much

more rapid detection can now be obtained with the monoclonal antibody use against Salmonella typhi flagellin. For detection of salmonella in blood DNA probes for specific antigens are also available.[34,35]

TREATMENT

Appropriate treatment of typhoid perforation was under controversy till 1957. Many surgeons advocated surgical treatment but with the advent of chloramphenicol into the market this trend has changed towards the conservative line of management.

In 1959 Huckstep insisted on conservative management on the basis of Oschner – Scherren regimen and pointed out the reasons which were as follows ;

Cons:- The friability of the terminal ileum and the liability for multiple perforations makes it bad for holding the sutures.

Pros:- The sterilisation of the bowel contents by the chloramphenicol therapy and the localisation of the perforation by the adjacent bowel loops itself.[36]

Absence of localisation in patients have led Hook et al to recommend surgical treatment in those patients. Nowadays surgical treatment is the best option available as conservative management is associated with significant mortality.[37,38]

SURGICAL TREATMENT

Preoperative resuscitation of patients by improving the hydration status with intravenous fluids , appropriate antibiotics , and total parenteral nutrition has considerably reduced the mortality rate from 28% to 10% in one previous study.[29]

The various surgical options available are;

- Drainage of the peritoneal cavity
- Simple closure
- Wedge resection and closure
- Resection anastomosis
- Ileotransverse colostomy
- Ileostomy

DRAINAGE OF PERITONEAL CAVITY

It is mainly indicated during the period of resuscitation and preparation before surgery in moribund patients. Here the flank drains are inserted under local anesthesia. As a sole procedure it has an unacceptably higher mortality rate.So it is mainly used as a bridging measure or as a preliminary measure before surgery in moribund patients.[38]

SIMPLE CLOSURE

Archampong recommended simple freshening of edges and primary closure. A significant rate of mortality of about 17.3% was associated with this procedure. The recommendations by Talwar et al is primary simple closure and limited surgery.[39,40]

WEDGE RESECTION AND CLOSURE

Here a wedge resection of ileal tissue is done around the perforation and the ileal defect is closed in two layers transversely. A mean mortality rates of about 4% has been reported with this procedure. Reports by Ameh et aladvocated an association of very high mortality rate with this procedure.[41]

RESECTION ANASTOMOSIS

Here resection of the affected segment and primary anastomosis has been advocated by some authors. Studies by Ameh et al recommends primary resection anastomosis over wedge resection & simple closure.[41,42]

ILEOTRANSVERSE COLOSTOMY

The above procedures can be combined with a side to side ileo transverse colostomy.[43,44] Eggleston and Lizzaralde recommends terminal ilealclosure and end to side ileo transverse colostomy which decreases the incidence of complications.[45] This anastomosis helps by diverting the faecal matter from reaching the diseased ileum and this reduces the risk ofcomplications.[38-40]

TUBE ILEOSTOMY

It was first introduced in 1940 by Lozoya . It was carried by passing a 24F foley catheter through the least edematous parts of the ileum. It is versatile ,simple , quick in decompressing the bowel and also prevents further decontamination of peritoneum by the faecal matter. Various authors in their studies have also reported a reduced rate of complications with this procedure. Karmakar et al and Cope et al recommends exterioration of suture line preventing further bowel contamination in case of reperforation.[24,42] If there is a confirmed preoperative diagnosis of perforation, Talwar et al recommends a Rutherford Morrison incision which is associated with a reduced rate of complications. Here the laprostomy comes into play in case of fulminant abdominal sepsis due to faecal fistula formation. It helps in draining the pus out of peritoneal cavity thus preventing further rise in abdominal pressure. The disadvantage of

this procedure is the perforation of the exposed bowel and incisional hernia formation.[40,43]

COMPLICATIONS

Typhoid perforation has a very high complication rates of 28% - 80%.[44-45]

Keenan et al reports in 1981[27]

COMPLICATIONS	%
Chest infection	55
Sepsis	46
Wound infections	33
Recurrent typhoid	11
Reperforation	5
G.I. fistula	5
Wound dehiscence	5

Santillana et al reports in 1991[28]

Wound infections	40.6
Respiratory	10.4
Renal failure	2.3
G.I. fistula	2.1
Melena	2
Icterus	2.1
Sepsis	3.1
Parotid abscess	0.7

TRAUMA

Trauma is a more common cause of ileal perforation is developed countries. The injury maybe due to blunt or penetrating trauma. The vast majority of traumatic perforations are from automobile or road traffic accidents. The penetrating injuries are commonly knife stabs or gunshot wounds. The mechanisms of injury postulated are

1. Crushing or pinching of bowel between the spine and a blunt object
2. Rupture of a closed loop due to increased abdominal and intraluminal pressure

Paran reported two patients with perforation of the terminal ileum in whom abdominal complaints evolved only 24-48 hours after trauma. They proposed a mechanism involving damage to the bowel wall leading to late rupture up to 48 hours after trauma. The diagnosis of injury is based on clinical findings, X-ray and abdominal paracentesis. X-ray might reveal free gas under the diaphragm.[45,46]

MECHANICAL CAUSES

When the perforation occurs secondary to a distal obstruction due to causes such as hernias, bands, volvulus, intussusception and obstructing growths it is considered to be due to a mechanical cause. The cause is vascular strangulation following obstruction either by a hernia or a band. And gangrenous segment of bowel ruptures possibly as a result of delayed surgical treatment. Increased intraluminal pressure may also lead to perforation. Mechanical causes are the one of the commonest causes of bowel perforation in the western world. These were responsible for 18 out of 76 cases of small bowel perforation as reported by Chaikof. The causes were adhesions in 12 patients, hernia in 4 and obstructive carcinomas in 2 patients.[47]

MALIGNANCY

Small intestinal malignancies are very rare accounting for 1-3% of all gastrointestinal malignancies. The reported small bowel tumors in order of frequency are adenocarcinoma, carcinoid, lymphoma and sarcoma. The commonest site is the Ileum. Lymphomas are the commonest small bowel tumors to perforate. Dixon et al in their series of 54 cases had 9 cases of lymphoma and two perforations due to small bowel carcinoma.[48]

INFLAMMATORY BOWEL DISEASE

Free perforation is a rare complication in Crohn's disease. Ileum is the commonest site of perforation in this disease. Steinberg et al in their series of seven patients of Crohn's with free perforation of small bowel had five with ileal perforation.[49] Dixon et al in their series of 54 patients had 5 with Crohn's disease. Chaikof reported 16 cases of Crohn's in the 76 patients of non-traumatic small bowel perforation. Perforation in Crohn's disease occurs during an acute exacerbation and is usually associated with distal obstruction. Simple closure is inadequate and has poor results. Menguy recommends primary excision and creation of a double-barreledileocolostomy with closure of stoma at a later date.[47, 48, 50]

NON-SPECIFIC PERFORATION

When the etiology of ileal perforation is not identifies, it is termed as a non-specific perforation. Dixon et al in their series had such results in 14 out of 54 patients.[48] Karmakar et al in their series of 30 patients of ileal perforation had 7 cases of nonspecific perforation. Many of these cases may be due to undiagnosed typhoid or other non-specific causes such as diet, drugs, viral or parasitic infections and infestations. It was earlier attributed to undiagnosed typhoid but these patients have different outcomes when compared to those with typhoid perforation. It has been

proposed that sub mucosal vascular emboli may be responsible for such perforations.[24,51]

DIVERTICULITIS

Perforation of diverticula is a rare cause of small bowel perforation. Huttunen et al in their series of 24 patients of perforation had this as the etiological factor in 4 patients, one with perforated ileal diverticulum, two with divertuculitis and one with ectopic gastric mucosa in a perforated Meckel's diverticulum. Nadkarni et al had two patients with perforated diverticula in their series of 32 patients.[51,52]

ISCHEMIC ENTERITIS

Ischemic enteritis is a rare cause of ileal perforation. Dixon in his series of 54 cases had 3 due to this cause.[48] The gross lesion can be described in four stages

1. Segmental bluish discoloration, edema and mucosal ulceration
2. Circular purple bands with edema of bowel wall
3. Intestinal segment becomes longer, rigid and pipe-like
4. The segment becomes thin and papery Perforation usually occurs in the fourth stage. Histological picture shows necrosis, the severity of which varies with the stage of the disease.[48]

MISCELLANEOUS

The miscellaneous causes reported are roundworm infestations, polyarteritis nodosa, radiation enteritis, steroid dependency, and AIDS. Remine reported 79 patients on steroids at the time of perforation. Patients receiving Prednisolone at a dose greater that 20mg/day had a mortality of 85.1%. Medical problems necessitating steroid therapy were myeloproliferative disorders, connective tissue disorders and metastatic cancer in 62% of patients. The risk of perforation was highest during the first three weeks of starting steroid therapy.[53]

Chatterjee H et al 2001 included two hundred and forty eight cases of proved typhoid ileal perforation were admitted and treated. Of these, 71% patients belonged to second and third decades of life. Male female ratio was 4:1. Abdominal pain (100%) fever (95%) and constipation (87%) were the main presenting symptoms. Abdominal guarding and rigidity (84%) were the principal physical signs. Plain radiograph of abdomen showed evidence of pneumoperitoneum in 57% of cases. The Widal test was positive for S. typhi in 74% of cases. Blood and bone marrow culture were positive for S. typhi in 9% and 30% respectively. Histology of the excised edges of perforation confirmed typhoid pathology in 62% of specimens. Many of the patients were treated conservatively in the first phase. In phase two and three vigorous resuscitation and early surgery was resorted to. Simple closure in two layers and wedge resection were the treatment of choice in most of the cases. Bypass, ileostomy and resection were done on few occasions. Chloramphenicol was the only drug used in the first phase. Other broad spectrum antibiotics were added to chloramphenicol with metranidazole in the second phase. Ciprofloxacin and metronidazole were the drugs of choice in the third phase. The mortality rate showed a dramatic improvement from 47.2% (first phase) to 17.7% (second phase) and as low as 7% in the last phase.[54]

Capoor MR et al 2008 determined the role of enteric fever in ileal perforations. A prospective cohort of 47 patients of ileal perforation was subjected to clinical examination and investigations for APACHE II scoring. Blood, ulcer edge biopsy, mesenteric lymph node and peritoneal aspirate were subjected to culture to determine the predominant aerobic bacterial isolate and its antibiogram. Seven patients (14.9%) required intensive care and seven (14.9%) developed septicaemia. Mortality was 17%. Highest isolation rate was seen in ulcer edge (70.2%) followed by lymph node (66%) culture. The bacterial spectrum was Escherichia coli

(23.4%), Enterococcus faecalis (21.3%), Salmonella enterica serovar Typhi (6.3%), Salmonella enterica serovar Paratyphi A (4.2%), etc. Enteric fever organisms are not the predominant causative agents of ileal perforations. Culture of ulcer edge biopsy, lymph node is crucial for aetiological diagnosis. The use of APACHE II triaging and prescription of antimicrobials based on the local pattern of susceptibility profi le of the aetiological agent is recommended.[55]

Ekenze SO, Okoro PE 2008 determined the morbidity and mortality of childhood typhoid ileal perforation in a tertiary referral centre in southeast Nigeria Retrospective evaluation of 89 children operated for typhoid ileal perforation over a 10-year period. There were 54 (60.7%) boys and 35 (39.3%) girls aged 1 15 years (mean 9.1 years). Thirty-nine (43.8%) were >10 years. Fever and generalized abdominal pain were the predominant symptoms for 5 21 days (mean 13.4 days) and 2 13 days (mean 8.8 days) respectively before presentation. Seventeen (89.5%) of those <5 years had vomiting. Pneumoperitoneum was demonstrated radiologically in 59 (66.3%) children. Surgical treatment involved simple closure in 46 (51.7%) children and segmental intestinal resection in 43 (48.3%). Surgical site infection 41 (46.1%), chest infection 21 (23.6%) and reperforation 19 (21.3%) were the commonest postoperative complications. The overall mortality was 17 (19.1%) from overwhelming infection. Age < 5 years and prolongation of perforation-operation interval worsened morbidity and mortality.[56]

Nuhu A et al 2010 evaluated the outcome of its surgical management in Nigerian children. There were 28 (60.86%) boys and 18 (39.13%) girls, with a mean age of 9.5 ± 3.22 (range, 15 months−15 years). Abdominal pain (45), fever (44), and abdominal distention (36) were the most common presenting symptoms and majority of the patients (36) perforated within 14 days of illness. Solitary ileal perforations were the most common

pathology, found in 31 (67.4%) cases. Simple closure of the perforations after debridement of the edges was the most frequent operative procedure performed. A total of 21 patients had one or more complications which included wound infection (21), postoperative fever (16), and wound dehiscence (6). Postoperative anaemia was a problem in 23 (50%) patients. The mortality rate was (13) 28.3%. The mean duration of hospital stay for survivors was 22.9 ± 12.3 (range, 6−46 days). This was not significantly affected by the location or number of perforations on the ileum.[57]

Tade AO et al 2011 determined the factors that influenced the outcome of surgical management of typhoid intestinal perforation. There were 13 males and 10 females with a male to female sex ratio of 1.3:1. The ages ranged from 19 to 51 years. Seventeen (73.9%) patients were aged between 20 and 34years.Two patients, one each from ASA grades IVE and VE, died on 1st and 2nd postoperative days respectively. The mortality of 8.7% was significantly associated with ASA class (P= 0.040). ASA class was strongly associated with severity of peritonitis (P=0.021). Complications occurred in 11 (47.8%) patients. Ten (43.5%) developed wound infection and one (4.3%) an entercutaenousfecalfistula. Wound infection was significantly associated with method of closure of perforation (P=0.034), and number of perforations (P=0.007). This study has shown that ASA class is a significant predictor of mortality in patients treated for typhoid intestinal perforation in the centre. They recommended that patients in ASA classes IV and V should have post-operative intensive care to reduce the risk of death.[58]

Patil V et al 2012 compared the outcome of tube versus loop ileostomy in management of ileal perforations. A total of 60 diversion procedures were performed over the period with 30 for each of tube and loop ileostomy. Typhoid and tuberculosis formed the most common etiology for ileal

perforation. The complication rate of tube ileostomy was 33%. Main complications related to tube ileostomy were peritubal leak, tube blockage. In patients with loop, overall complications in 53% majority were peristomal skin irritation and wound infection following ileostomy closure. Two patients developed obstruction following ileostomy closure which needed reoperation.[59]

Agu K et al 2014 determined the prevalence, morbidity, and mortality of this disease in patients mostly drawn from a rural area. Of the 50 patients included in the study, 22 were males with the highest rate in patients aged 20 years and younger. Fever was the commonest symptom and at initial presentation, the mean pulse and respiratory rates were significantly higher in the patients who subsequently died than in those who survived ($P < 0.05$). All the perforations occurred in the ileum; 62 % of the patients had solitary perforations, 28 % had double perforations, and 10 % had three or more. Fifty-eight perforations were treated by simple closure in two layers, 4 patients had ileal resection and anastomosis, and 2 underwent right hemicolectomy. The mean interval between operation and death was 1.7 days. The overall mortality rate was 30 %, but among those with three or more perforations, mortality was 100 %. Typhoid ileal perforation still carries a high mortality especially in rural areas.[60]

Mittal S et al 2014 included sixty proven cases of ileal perforation patients admitted to Surgical Emergency were taken up for emergency surgery. Randomisation was done by senior surgeons by picking up card from both the groups. The surgical management was done as primary repair (group A) and loop ileostomy (group B). An increased rate of postoperative complications was seen in group A when compared with group B with 6 (20%) patients landed up in peritonitis secondary to leakage from primary repair requiring reoperation as compared to 2 (6.67%) in ileostomy closure. A ratio of 1:1.51 days was observed between hospital stay of

group A to group B. In cases of ileal perforation temporary defunctioning loop ileostomy plays an important role. They recommended that defunctioning ileostomy should be preferred over other surgical options in cases of ileal perforations.[61]

Verma H et al 2015 conducted prospective observational study including 41 patients presenting with perforation peritonitis due to ileal perforation and managed with ileostomy. Mean duration of preoperative resuscitation was 14.73+13.77 hours. Operative findings showed that 78% patients had a single perforation; most perforations were 0.6–1 cm in size and within 15 cm proximal to ileocecal junction. Mesenteric lymphadenopathy was seen in 29.2% patients. On histopathological examination, nonspecific perforations followed by typhoid and tubercular perforations respectively were the most common. Patients with ileal perforations are routinely seen in surgical emergencies and their demography, clinical profile, and intraoperative findings may guide the choice of procedure to be performed.[62]

Srihari G, Sudheer D 2016 assessed the outcomes in these patients and the factors affecting prognosis. Fifty cases of ileal perforation were included in this study from the period between August 2013 to February 2015. Factors were tabulated and statistically analysed to study their contribution. Typhoid was the most common cause of ileal perforation in this study followed by nonspecific perforations. Patients presented primarily in the second and third decades of life with a male preponderance. Patients had a 68% complication rate with wound infection and dehiscence and faecal fistula. Mortality was 14% with fistula and septicaemia being the commonest causes. They e found typhoid fever as the most common aetiology for ileal perforation. Ileal perforations have a significant morbidity and mortality despite adequate operative intervention and postoperative care. Age, lag period, typhoid perforations

and hypoalbuminaemia were found to be significantly contributing to morbidity. Mortality was influenced by age and shock on presentation.[63]

Oseni-Momodu EO et al 2017 determined the pattern and treatment outcome of typhoid enteritis with ileal perforations, leading to observed improvement of treatment of perforation due to prompt simple surgical management and determine whether the mortality of perforation in typhoid was still adamantly 4 times as high as before. Sex differential of the152 admitted children was female 53(36%) and males 96 (64%) ratio F: M of 1:1.8 aged from 0.6 to 17 years. They had a mortality of nine cases (6 %) M: F ratio of 2:1.Age range of the group was 16.4; median was 8.0, standard deviation of 3.48, min of 0.6 and max of 17 and variance was 12.11.LoS was highest for male children. The QoL of the children and parents/guardians were better. Quick diagnosis, immediate resuscitation and prompt surgical decision and simple surgical intervention were vital to the improved morbidity and mortality recorded in this study.[64]

Aliyu S et al 2017 determined the pattern of presentation and the outcome of management. A total of 279 patients were seen, 268 analyzed and 11 were excluded due to incomplete records. Age ranged from 3 to 50 years with male to female ration of 1.1:1 and a mean of 14.75 years. The peak age group was 11-20 years accounting for 39.93%. The clinical features were abdominal pain in 99.25% and abdominal tenderness in all patients. Procedures done were simple closure of perforation in 87.31% patients, resection and anastomosis in 70.84%. Post-operative complications were surgical site infection in 21.64%, and renal failure in 1.12%. The mortality was 14.18%. Typhoid perforation posed a major health hazard with high morbidity and mortality especially in a low socioeconomic environment where poor personal hygiene, improper human waste disposal, malnutrition, and poor social amenities exist. Despite high mortality associated with the disease, timely diagnosis,

aggressive resuscitative measures as well as early surgical intervention can go a long way in reducing menace of the disease.[65]

Ch B et al 2017 highlighted the spectrum of perforation peritonitis as encountered by them in rural southern east Rajasthan. The maximum number of patients in the study was in age group of 31- 40 years (23%) with a mean age was 40.29, years. There were 89 males (89%) as compared to 11 females (11%). The most common site of perforation in the series was gastroduodenal (81%) followed by small bowel perforation (13%), appendicular perforations (4%), colonic perforation (1%) and rectal perforation (1%). The rate of complication was 21%. Mortality rate was 7% and significantly high (100%) in patients coming to the hospital after 24 hours. In contrast to western literature, where lower gastrointestinal tract perforation, upper gastrointestinal tract perforation constituted the majority of cases in India.[66]

Mallik NR et al 2018 evaluated the current pattern of perforations, study various aetiological factors, management and overall mortality and morbidity with contributing factors. Most of the patients presented with diffuse pain abdomen, and fever, and clinical signs of peritonitis. Among the various operative procedures, they have employed, ileostomy had a significant higher rate of post-operative complications, However stoma can be considered as this a lifesaving procedure in a hemodynamically unstable patient. Choice of operation remains controversial. The exact procedure should be individualised and employed as per patients pre-operative condition, intra operative findings and patients overall hemodynamic condition.[67]

Hameed F et al 2018 determined the clinical presentation of typhoid ileal perforation and its outcome after treatment at tertiary care Hospital. Total 40 patients were studied. Mean age of the patients was 27.08+22.0 years

with the range of 10 to 60 years. Most common 82.5% were male and 17.5% were female. Abdominal pain and tenderness was found in all the cases. Regarding signs and symptoms, abdominal distension (97.5%) and fever (95%) were the most common presenting complaints. Primary closure in two layers was done in 40.0% cases, segmentation resection end to end anastomosis procedure was done in 10.0% cases and primary repair with proximal ileostomy was done in 50.0% cases. Wound infection developed in 62.5% patients followed by wound adhesion in 30.0% cases. Mortality rate of 10.0%. They observed wound infection and wound adhesion were the commonest complications with mortality rate was 10%.[68]

Nema AA, Darshan JR 2018 studied clinical presentations, to evaluate management pattern of typhoid ileal perforation, to determine mortality and morbidity of perforation and to study the re-exploration rate and causes of re-exploration and its effect on mortality and morbidity. A total 45 patients with typhoid ileal perforation were included in the study. Among them, 32 cases (71%) undergone the simple primary closure of the perforation and peritoneal lavage after refreshing the edge, 7 cases (16%) undergone exploratory laparotomy with proximal loop ileostomy with primary closure and 6 (13%) were operated by exploratory laparotomy with resection anastomosis. Mean duration of the stay for patient undergone PC+PL was 10.20 days and for ileostomy it was 18.4 days and for RA + PL it was 18.6 days. Total 37 incidences of complications were found in 45 cases. Among them wound infection was presented in 16 (43%) and burst abdomen presented in 2 (5%) cases. Fecal fistulae, post-operative collection and pneumonitis were present in 4 (11%) cases each. The overall mortality was found nearly 4 percent in the study. The typhoid ileal perforation should be always treated surgically.[69]

Jha PK et al 2018 conducted study on pattern of ileal perforation in the experience. Total 118 patients were enrolled for their study after confirmation of ileal perforation on exploratory laparotomy.Out of total 118 patients 52 cases (44%) were in traumatic, typhoid causes perforation in 86% (57 cases) tuberculosis in 14% (9 cases) and 66 cases (56%) were in non-traumatic group, penetrating injury is more common than blunt trauma abdomen. Males are more commonly affected than females in among all cases of ileal perforation. Patients with traumatic ileal perforation seek early medical attention as most of the patients (44%) admitted within 12 hours after accident where as in case of non-traumatic cases 53% patients admitted after 2 days. Most common operative procedure performed is Loop ileostomy in case of non-traumatic perforation (49%) and Resection and anastomosis preferred in traumatic perforation (63%). Mortality rate is about 20% in all types of perforation.[70]

Singla S et al 2019 highlighted the spectrum of perforation peritonitis as encountered in a tertiary care centre in haryana. The most common etiology of perforation peritonitis was peptic ulcer disease (41%) followed by enteric fever (15%) and tuberculosis (13%)The most common site of perforation in this series was gastroduodenal (43%) followed by terminal ileum (30%). Mortality rate was 5% and significantly high in patients coming to the hospital after 24 hours. Early recognition of symptoms and referral is very important in reducing mortality and morbidity.[71]

Qazi SH et al 2020 characterized typhoid-related ileal perforation in the context of the population-based Surveillance of Enteric Fever in Asia Project (SEAP).Most of the cases were in the 0–15 (117/242; 48%) and 16–30 (89/242; 37%) age groups. In all countries, males were most affected: Pakistan 74.9% (180/242), Nepal 80% (4/5), and Bangladesh 100% (2/2). Blood culture was done on 76 cases; 8 (11%) were positive for S. Typhi, and all were extensively drug resistant (XDR) S. Typhi.

Tissue cultures was done on 86 patients; 3 (3%) were positive for S. Typhi, and all were XDR S. Typhi, out of 86 samples tested for histopathology 4 (5%) revealed ileal perforation with necrosis. Culture or histopathology confirmed total 15 (11%) enteric fever cases with ileal perforation are similar to the clinically diagnosed cases. There were 16/242 (7%) deaths from Pakistan. Cases of ileal perforation who survived were more likely to have sought care before visiting the sentinel hospital (P = .009), visited any hospital for treatment (P = .013) compared to those who survived. Although surveillance differed substantially by country, one reason for the higher number of ileal perforation cases in Pakistan could be the circulation of XDR strain of S. Typhi in Karachi.[72]

Chukwubuike KE 2020 determined the incidence, pattern and outcome of treatment of typhoid intestinal perforation (TIP) in children in a teaching hospital in Enugu, Nigeria. There were 200 cases of TIP and this accounted for 35.7% of all pediatric surgeries performed during the period of the study. There were 150 (75%) males and 50 (25%) females which correspond to a male female ratio of 3:1. The ages of the patients ranged from 6 to 15 years with a median of 11 years. One hundred percent of the patients had fever and abdominal pain. Anemia, hypokalemia and a single ileal perforation were recorded in most of the patients. Primary closure of the perforation was the most common performed surgical procedure. Surgical site infection, burst abdomen and residual intra-peritoneal abscess accounted for most of the post-operative complications. Mortality was 8.5%.[73]

Das PK et al 2020 highlighted the spectrum of perforation peritonitis encountered in surgery unit. It was observational prospective of 100 cases of perforation peritonitis treated in the hospital. All cases of perforative peritonitis whether spontaneous, infective or neoplastic pathology were included in this study. The maximum numbers of patients were in age

group between 31 to 40 years (39 %) with mean age 35 years. Male female ratio was 9:1. The most common aetiology of perforation peritonitis was peptic ulcer disease (73%) followed by enteric fever (12%), appendicitis (10%), tuberculosis (3%) and malignancy (2%). The most common sites of perforation were in descending order of frequency - first part of the duodenum (65%), terminal ileum (12%), appendix (10%), gastric antrum (9%), jejunum (3%) and rectum (1%). Abdominal pain (100%) and vomiting (81%) were the most common symptoms while tachycardia (96%), muscle guard and rigidity (100%) were the common signs. Approximately 15-20% presented late with features of shock. Mortality rate was 2% and was significantly high in patients coming hospital late. Gastrointestinal perforations are one of the most common surgical emergencies. Duodenal perforations are most common. Ileal perforations secondary to enteric fever have highest morbidity. Early recognition and timely appropriate intervention is very important in reducing morbidity and mortality.[74]

Abo-Halawa NA et al 2020 presented the possible etiological factors, clinical findings, and operative procedures of NIP in the locality. A total of 34 neonates with NGIP were included in this study. The median age at presentation was (15.8 ± 7.0 SD) days. The median interval between presentation and surgical interference was (2.0 ± 1.1 SD).Necrotizing enterocolitis [NEC] was the commonest cause of neonatal gastro-intestinal perforation. The commonest site of perforation was the colon [11cases]. The overall mortality rate was 11 cases [32.4%]. The main cause of mortality was neonatal NEC [6 cases]. Eight cases [40 %] died out of 20 cases which the interval between the presentation and interference were more than one day. Neonatal gastro-intestinal perforations are still associated with high mortality rate in the institutions, and delayed

diagnosis with increased interval between the presentation and surgical intervention are associated with increased mortality.[75]

Babu NS 2021 assessed the outcomes in these patients and the factors affecting prognosis. All the cases suspected of perforated ileum were included in the study. History with special reference to the presence of fever, pain, vomiting, abdominal distension, constipation, and treatment before admission was taken. Vital signs, hydration, abdominal distension, tenderness, guarding, and presence of free fluid were noted. Systemic examination of cardiovascular, respiratory, and central nervous systems was done. All routine blood investigations along with Chest X-Ray, Electrocardiogram, Peritoneal fluid culture, and Pus culture in case of wound infection. In patients wherein, a resection was done the specimen was histopathologically examined. Out of n=40 cases included in the study n=23(57.5%) were typhoid perforations and nonspecific perforations were found in n=12(30%) cases, traumatic perforations were found in n=5(12.5%) cases. Most of the patients presented with symptoms and signs of peritonitis. The commonest symptoms were abdominal pain, fever, and vomiting. The commonest signs were abdominal tenderness, guarding, intra-abdominal free fluid, and dehydration. Most patients with typhoid gave a history of fever 12.5 % of patients were in shock. Typhoid is the commonest cause of Ileal perforations. The male population is affected most of the time as compared to females. It tends to occur commonly in the second or third decade of life. Traumatic perforations have better outcomes because of healthy bowel conditions. Typhoid perforations have greater morbidity or mortality. The other factors affecting the outcomes are the lag period, increased age, and presence of shock at admission. The type of surgical procedures did not affect the outcome.[76]

Alla S et al 2022 studied epidemiology and various factors affecting morbidity and mortality of ileal perforation. This study is a hospital based

prospective and descriptive study of patients admitted from November, 2020 to October, 2021. 50 patients of ileal perforation who were admitted in P.B.M. Hospital during this period have been included in the study. typhoid fever accounting for 34% of total cases, 42% were treated by ileostomy, 34 had complications. Out of 50 cases 34 had complications around half cases had wound dehiscence. Ileostomy was the most common (n=21, 42%) surgical procedure done in cases of ileal perforation. Wound dehiscence was the most common (n=19, 55.88%) post operative complication observed among study subjects.: Early diagnosis is essential since a proper diagnosis and its therapy are essential to the prognosis. Traumatic perforations have a positive outcome since the lag time is usually short. The kind of surgery performed has no effect on the death rate, however stoma development is linked to less problems.[77]

MATERIAL AND METHODS

The study was conducted among the patients admitted to the emergency with ileal perforation peritonitis of the Dayanand Medical College and hospital, Ludhiana

Study location - Dayanand Medical College and hospital, Ludhiana.

Study design – A Prospective study to assess the pattern and outcome of patients with ileal perforation

Ethical approval

Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol.

STUDY DURATION:- October 2021 - Oct 2022

SOURCE OF DATA

The study was conducted among the patients admitted to the emergency with ileal perforation peritonitis of the Dayanand Medical college and hospital, Ludhiana.

METHOD OF COLLECTION OF DATA

Inclusion Criterion:

1) Age >18 year and <70 years

2) Either gender

Exclusion Criterion:

1) Age < 18 years and > 70 years

2) Patients with Psychiatric illpatient.

3) Patients with Radiation enteritis

Sample size calculation [70,71]

The Formula used for calculation of sample size is

$n = \frac{Z\alpha^2 P(1-P)}{E^2} = 60$

P is for prevalence = 19%

E be absolute error = 10%

Zα =1.96 at 95% confidence level

Thus, the minimum sample size is n= 60.

Duration of Study/ Number of Cases: 60 cases

Outcome: Acces the outcome of mortality and morbidity in ileal perforations peritonitis with early and delayed presentation coming in DMC AND HOSPITAL.

(Name of the method in plan): (1) simple primary repair of perforation

(2) primary ileostomy (3) resection and anastomosis

METHODOLOGY

All the patients with acute abdomen were admitted in Emergency Deptt of DMCH. A thorough history was taken and detailed examination done as per proforma. After thorough resuscitation and informed consent the patients were subjected to exploratory laparotomy and proceed under General Anesthesia. Operative findings were recorded. The type of surgical procedure was decided on basis of operative findings (1) Simple primary closure was done in good bowel condition in transverse axis, first layer was taken with absorbable suture material vicryl 3/0 and second

layer was taken as interrupted Lambert sutures burying the first layer with silk 3/0. 2) The cases where large sized, multiple perforations and bad bowel condition were managed by resection of involved segment and anastomosis of both ends. At first the 4th layer is taken in continuous interlocking or interrupted manner with silk 3/0 then third layer is taken which is continued as second layer and completed by taking Connell sutures with absorbable material vicryl 3/0. Then first layer is taken as continuation of fourth layer. Mesenteric gap is also approximated to prevent herniation of contents. 3) loop ileostomy was made in bad bowel condition of the patient , multiple perforations, poor vitals and delayed presentation of patient. In all cases 2 abdominal drains were kept 1 in pelvis and other in Morrisons pouch. In all cases except trauma patient margins of perforation were trimmed and tissue was taken from the margins and sent for bacterial culture and histopathology examination. The abdomen was closed in single layer with PDS No 1 and skin was closed with monofilament polyamide black 2/0. The variables studied in the postoperative period were wound infection, wound dehiscence entero-cutaneous fistula and mortality

STATISTICAL ANALYSIS: Data were described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. For comparing categorical data, Chi square ($\chi 2$) test was performed and fisher exact test was used when the expected frequency is less than 5. A probability value (*p* value) less than 0.05 was considered statistically significant. All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

OBSERVATION & RESULTS

The present study was conducted for assessing the pattern and outcome of 60 patients with ileal perforations. Following results are obtained:

Table 1: Distribution of patients according to age

Age group (years)	Number	Percentage
≤30	11	18.33
31 to 40	14	23.33
41 to 50	20	33.33
51 to 60	9	15
More than 60	6	10
Total	60	100
Mean ± SD	43.03 ± 12.56	

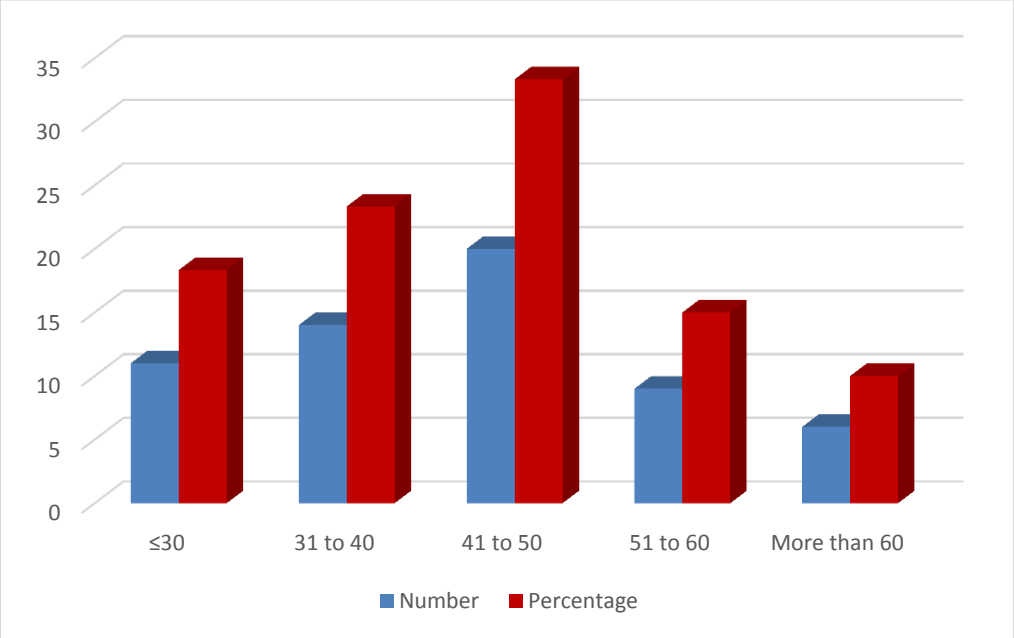


Figure 1: Distribution of patients according to age

33.33 percent of the patients belonged to the age group of 41 to 50 years while 23.33 percent of the patients belonged to the age group of 31 to 40 years. 18.33 percent of the patients belonged to the age group of ≤30 years. Mean age of the patients with ileal perforation was 43.03 years.

Table 2: Distribution of patients according to gender

Gender	Number	Percentage
Males	43	71.67
Females	17	28.33
Total	60	100

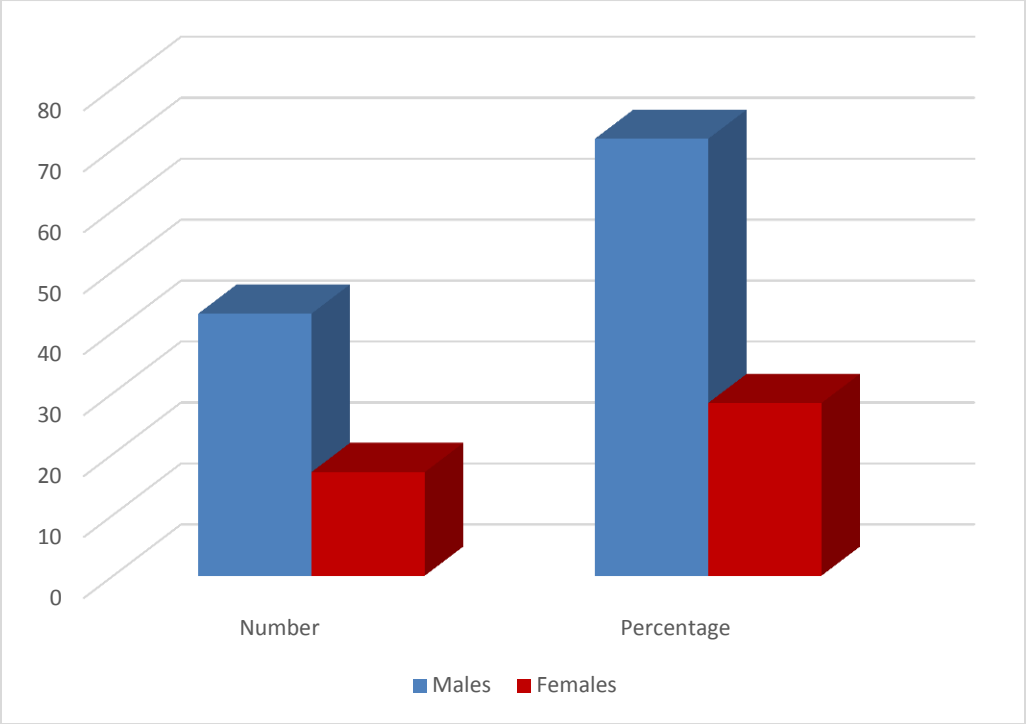


Figure 2: Distribution of patients according to gender

Out of 60 patients with ileal perforation, 71.67 percent of the patients were males while the remaining were females.

Table 3: Distribution of patients according to presenting symptoms

Presenting symptom	Number	Percentage
Abdominal pain	60	100
Constipation	52	86.67
Distension	60	100
Fever	43	71.67
Vomiting	31	51.67

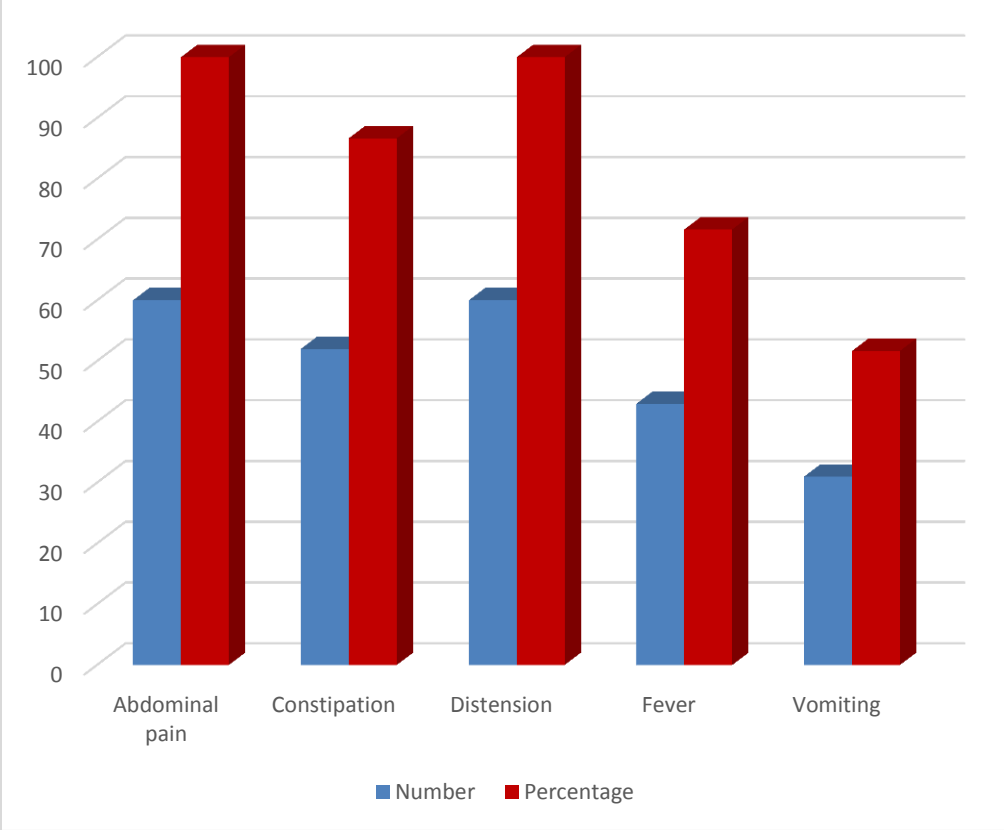


Figure 3: Distribution of patients according to presenting symptoms

Among the 60 patients with ileal perforation, most common presenting complaint was abdominal pain and distension found to be present in 100 percent of the patients. Constipation, fever and vomiting was seen in 86.67 percent, 71.67 percent and 51.67 percent of the patients respectively.

Table 4: Time of presentation

Time of presentation	Number	Percentage
Early presentation (less than 72 hours)	46	76.67
Late presentation (More than 72 hours)	14	23.33

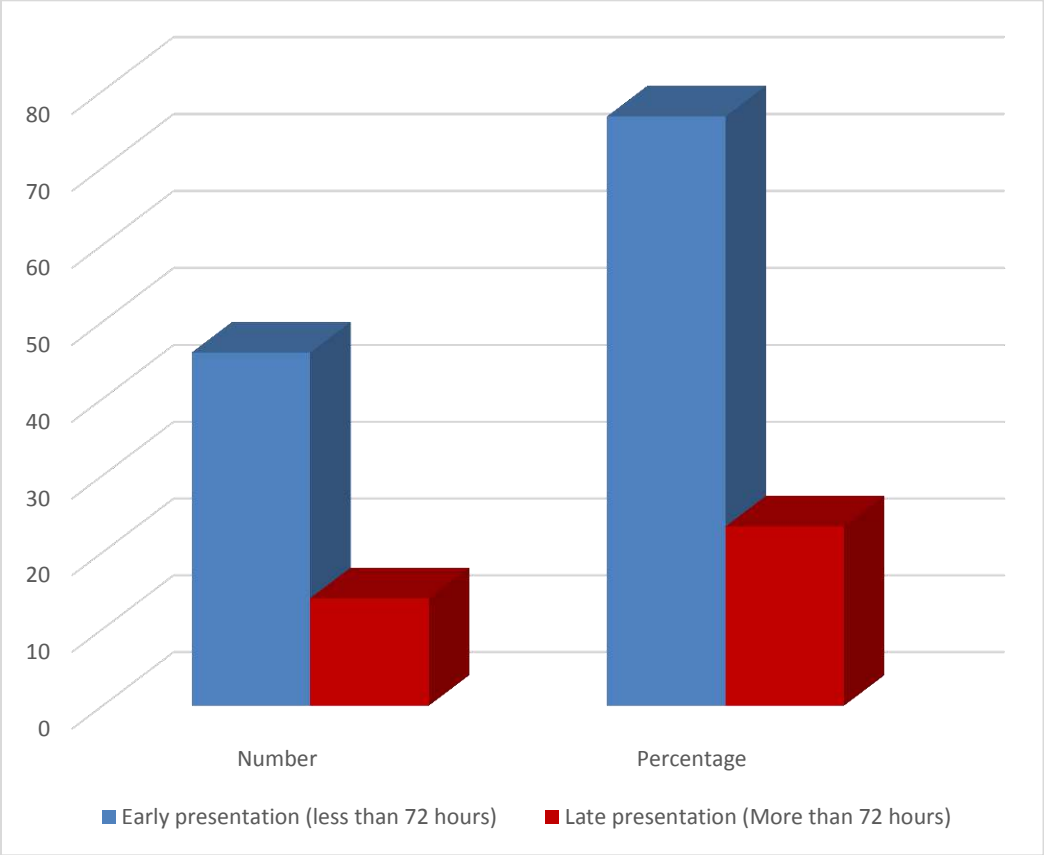


Figure 4: Time of presentation

Majority of the patients with ileal perforation (76.67 percent) presented within 72 hours (early presenters) while 23.33 percent of the patients with ileal perforation presented after 72 hours (late presenters).

Table 5: Number of perforations

Number of perforations	Number	Percentage
Single	45	75
Multiple	15	25
Total	60	100

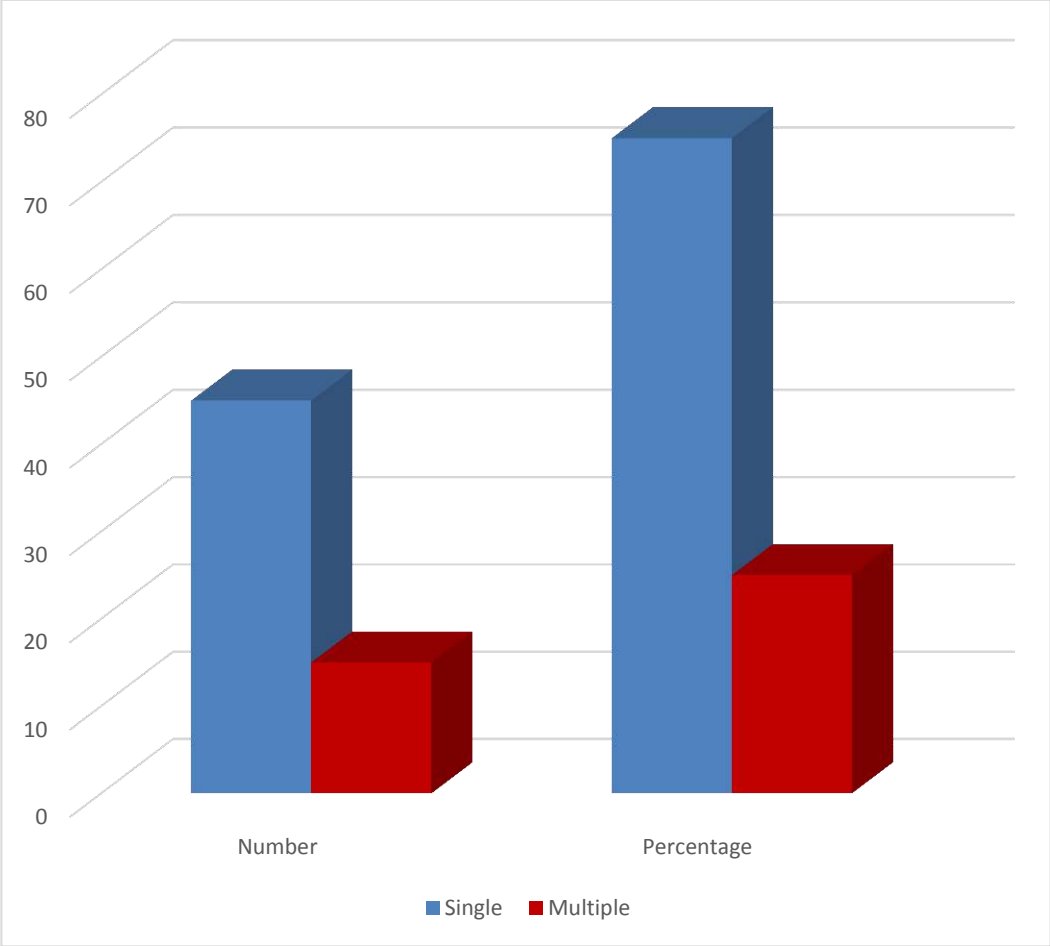


Figure 5: Number of perforations

Majority of the patients with ileal perforation (75 percent) had single perforation while 25 percent of the patients had multiple perforations.

Table 6: Distribution of patients according to location of perforation

Distance from Ileocecal (IC) junction	Number	Percentage
Less than 10 cm	10	16.67
10 to 30 cm	20	33.33
More than 30 cm	15	25
Multiple	15	25
Total	60	100

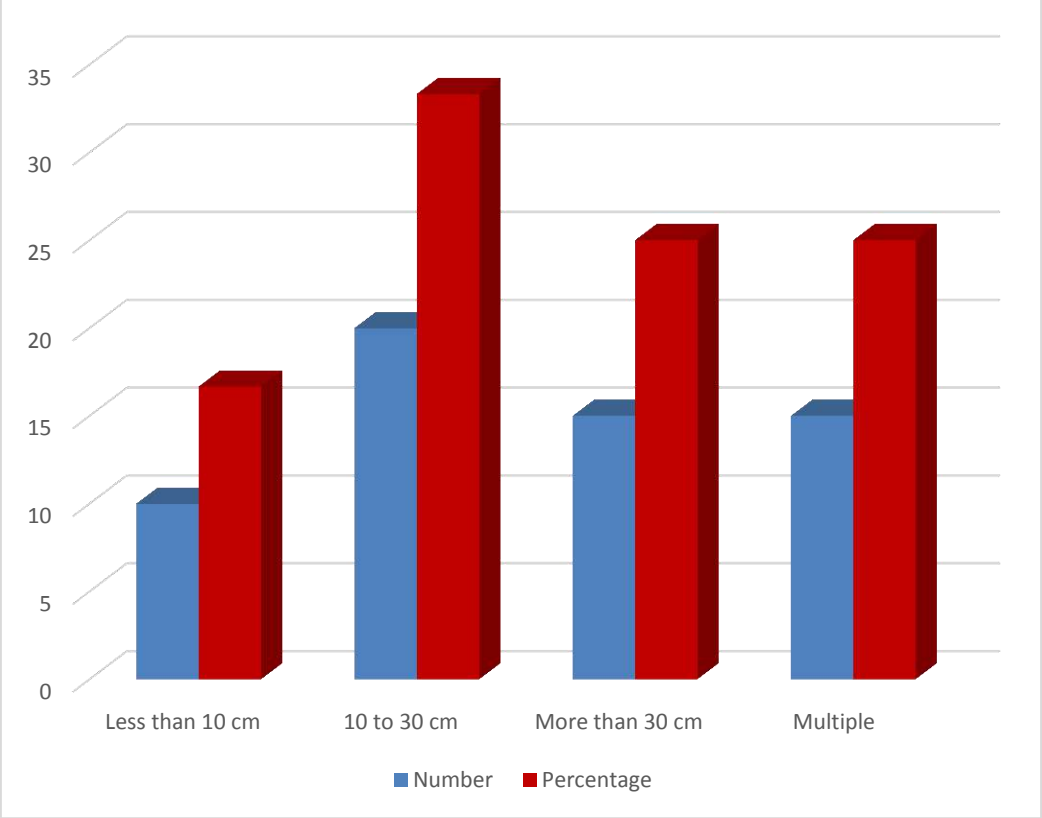


Figure 6: Distribution of patients according to location of perforation

Among the 60 patients with ileal perforation, 33.33 percent of the patients had perforation located at a distance of 10 to 30 cm from IC junction while it was more than 30 cm in 25 percent of the patients.

Table 7: Co-morbidities

Co-morbidities	Number	Percentage
Diabetes	3	5
Hypertension	5	13.33

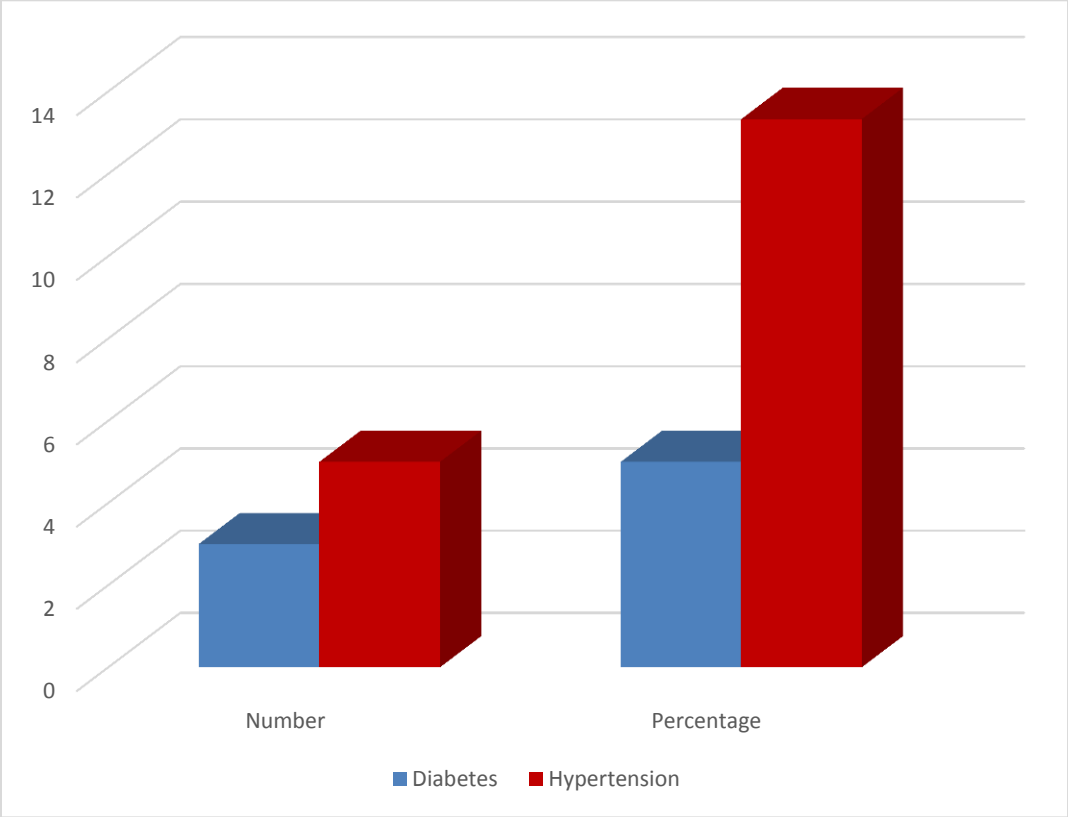


Figure 7: Co-morbidities

Diabetes and hypertension were seen in 20 percent and 25 percent of the patients respectively.

Table 8: Distribution of patients according to etiology

Etiology	Number	Percentage
Typhoid	29	48.33
Tuberculosis	12	20
Traumatic	10	16.67
Non-specific	9	15
Total	60	100

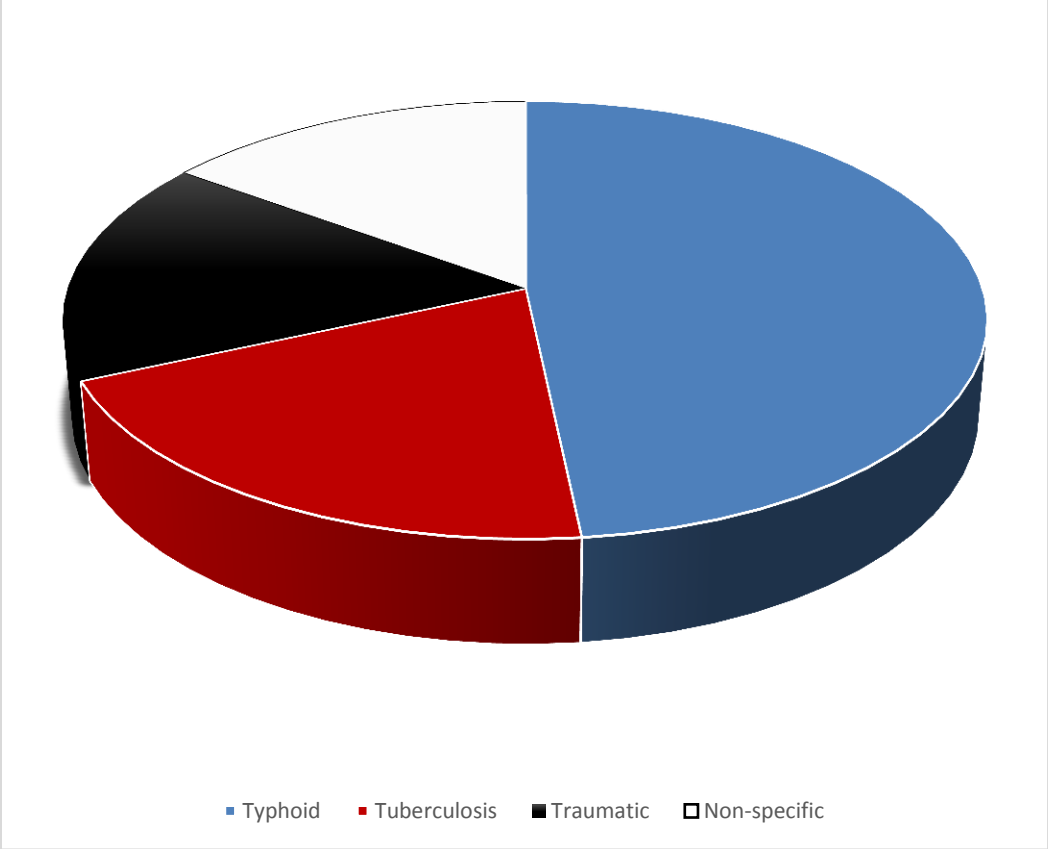


Figure 8: Distribution of patients according to etiology

Typhoid was the chief etiologic factor responsible for ileal perforation, found to be present in 48.33 percent of the patients. Tuberculosis and traumatic cause of ileal perforation was seen in 20 percent and 16.67 percent of the patients respectively. In 15 percent of the patients, the cause was non-specific/unknown.

Table 9: Distribution of patients according to treatment

Treatment	Number	Percentage
Simple closure of perforation	10	16.67
Resection-anastomosis	15	25
Loop ileostomy	35	58.33
Total	60	100

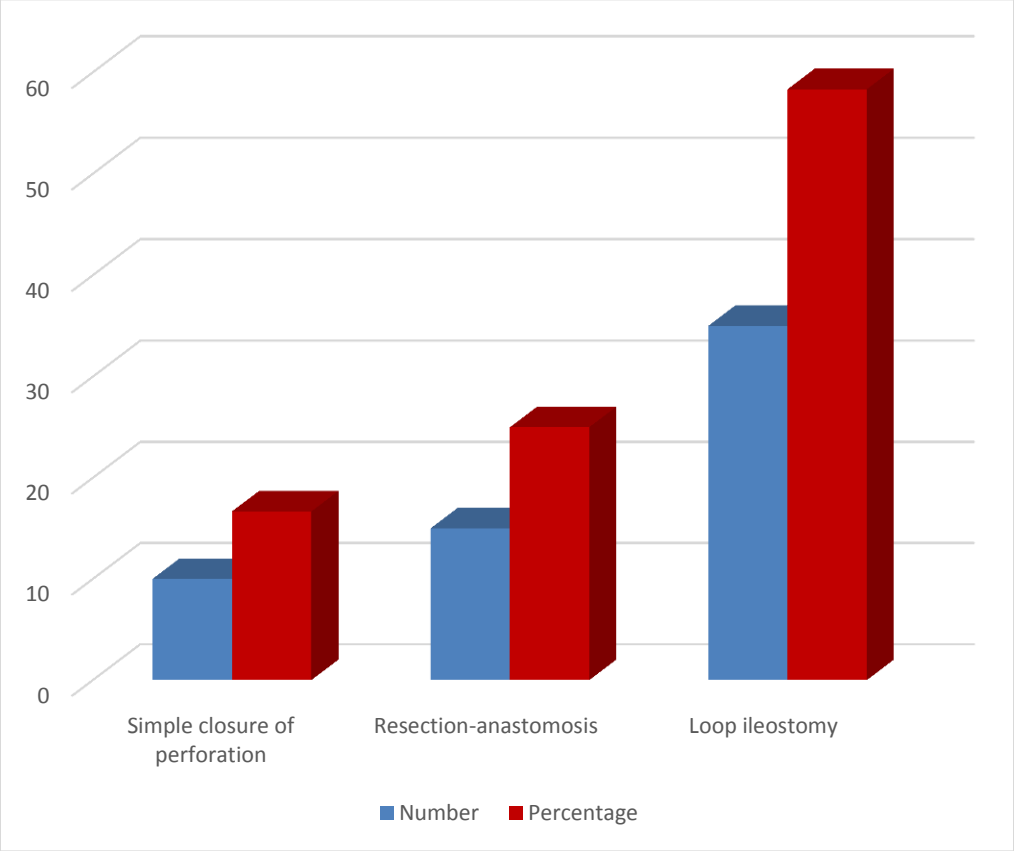


Figure 9: Distribution of patients according to treatment

Out of 60 patients with ileal perforation, loop ileostomy was done in 58.33 percent of the patients while simple closure of perforation and resection-anastomosis was done in 16.67 percent and 25 percent of the patients respectively.

Table 10: Distribution of patients according to outcome

Outcome	Number	Percentage
Mortality	4	6.67
Post-surgical complications	16	26.67

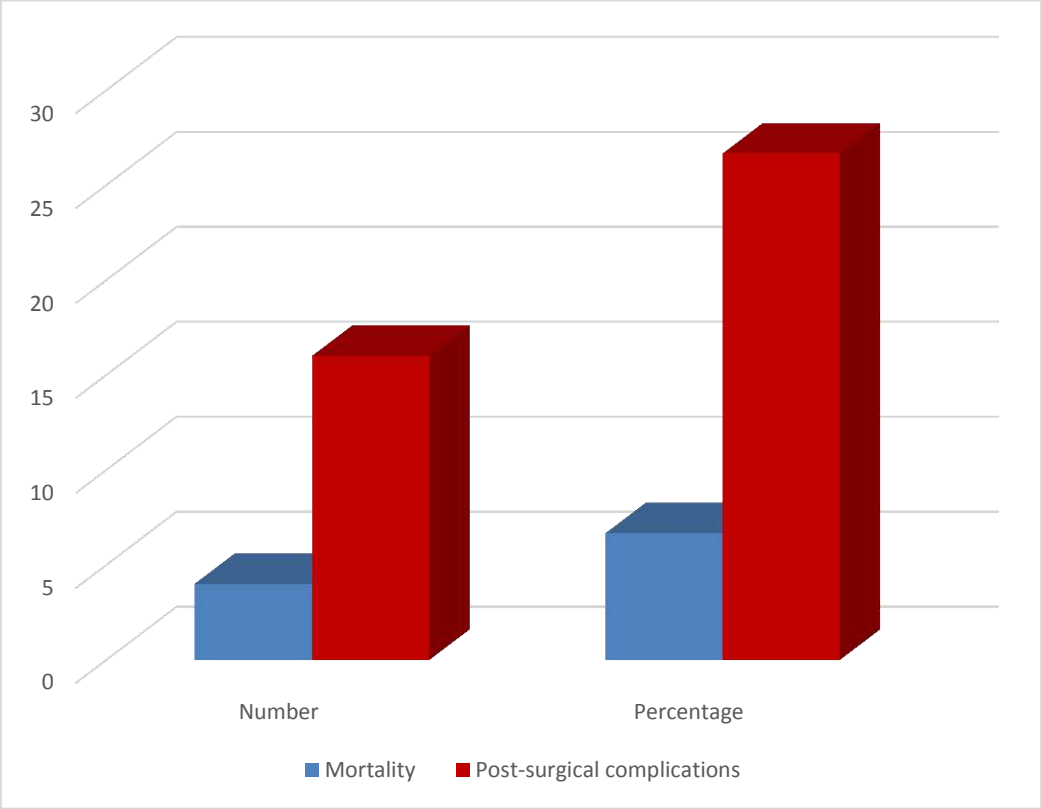


Figure 10: Distribution of patients according to outcome

Out of 60 patients with ileal perforation, mortality was seen in 6.67 percent of the patients while post-surgical complications were seen in 26.67 percent of the patients.

Table 11: Distribution of patients according to postsurgical complications

Postsurgical complications	Number	Percentage
Wound infection	8	13.33
Faecal fistula	5	8.33
Anastomotic leak	2	3.33
Intraabdominal abscess	1	1.67

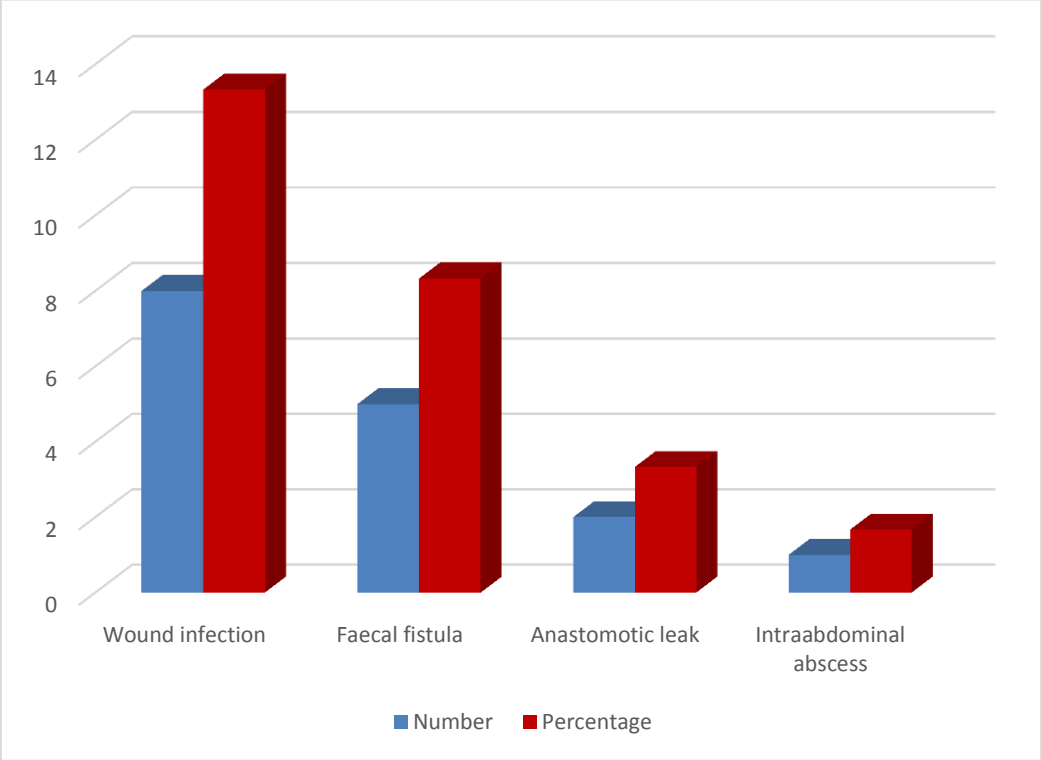


Figure 11: Distribution of patients according to postsurgical complications

Wound infection, Faecal fistula, anastomotic leak and intraabdominal abscess were seen as postsurgical complications in 13.33 percent, 8.33 percent, 3.33 percent and 1.67 percent of the patients respectively.

Table 12: Correlation of etiology with type of operative procedure

Operative procedure	Typhoid		Tuberculosis		Traumatic		Non-specific		Total	
	n	%	n	%	n	%	n	%	n	%
Simple closure of perforation	5	17.24	1	8.33	2	20	1	11.11	10	16.67
Resection-anastomosis	6	20.69	1	8.33	7	70	2	22.22	15	25
Loop ileostomy	18	62.07	10	83.33	1	10	6	66.67	35	58.33
Total	29	100	12	100	10	100	9	100	60	100
p- value	0.018 (Significant)									

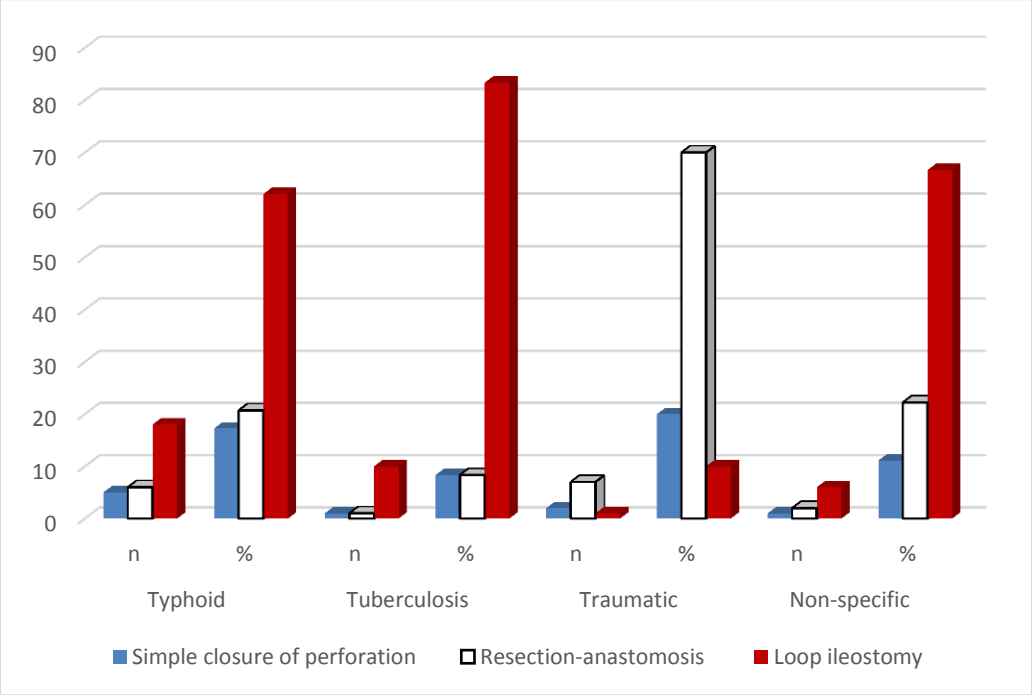


Figure 12: Correlation of etiology with type of operative procedure

While correlating the etiology with type of operative procedure, it was seen that in 62.07 percent and 83.33 percent of the patients with typhoid and tuberculosis as etiology, loop ileostomy was done while among 70 percent of the patients with traumatic etiology, resection anastomosis was done. While analysing the correlation statistically, significant results were obtained.

Table 13: Correlation of mortality with etiology of ileal perforation

Etiology	Mortality present		Mortality absent		Total	
	n	%	n	%	n	%
Typhoid	2	6.9	27	93.1	29	100
Tuberculosis	1	8.33	11	91.67	12	100
Traumatic	1	10	9	90	10	100
Non-specific	0	0	9	100	9	100
Total	4	6.67	56	93.33	60	100
p- value	0.225					

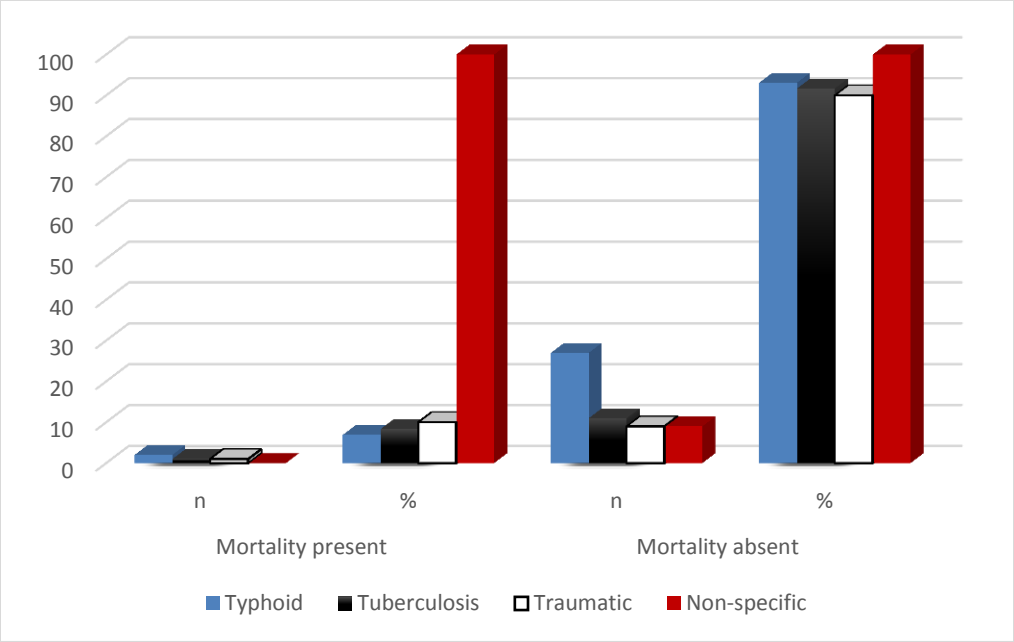


Figure 13: Correlation of mortality with etiology of ileal perforation

Mortality was present in 6.9 percent, 8.33 percent and 10 percent of the patients with typhoid, tuberculosis and traumatic etiology of ileal perforation. While analysing the results statistically, no significant pattern and correlation was seen among occurrence of mortality with etiological profile of ileal perforation.

Table 14: Correlation of complications with treatment

Treatment	Wound infection		Faecal fistula		Anastomotic leak		Intraabdominal abscess		Total	
	n	%		n	%		n	%		n
Simple closure of perforation	4	50	3	60	0	0	1	100	8	50
Resection-anastomosis	3	37.5	1	20	2	100	0	0	6	37.5
Loop ileostomy	1	12.5	1	20	0	0	0	0	2	12.5
Total	8	100	5	100	2	100	1	100	16	100
p- value	0.117									

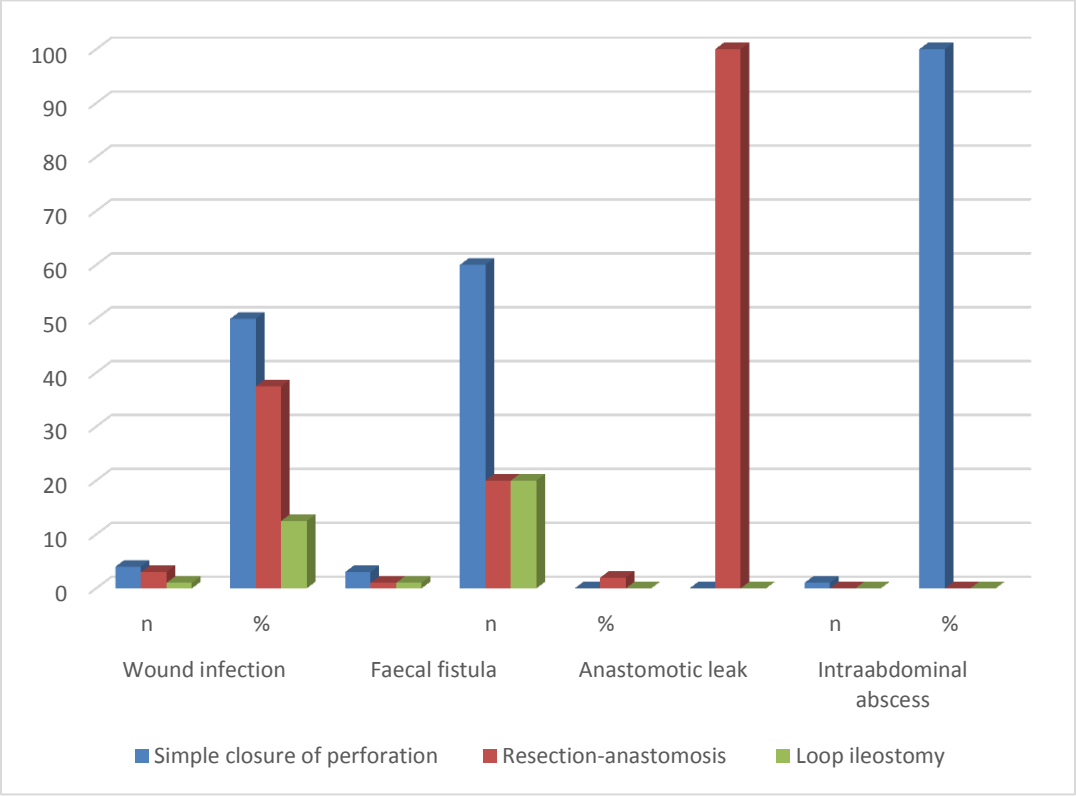


Figure 14: Correlation of complications with treatment

Out of 8 patients with wound infection, simple closure of perforation was done in 50 percent of the patients while resection-anastomosis and loop ileostomy were done in 37.5 percent and 12.5 percent of the patients respectively. Out of 5 patients with faecal fistula, simple closure of perforation was done in 60 percent of the patients while resection-anastomosis and loop ileostomy were done in 20 percent of the patients each. Both the cases of anastomotic leak were seen in patients undergoing resection-anastomosis. Single case of intraabdominal abscess was reported in patients undergoing treatment by simple closure by perforation. While analysing the results statistically, no significant pattern and correlation was seen among occurrence of complications with type of treatment done among ileal perforation patients.

Table 15: Correlation of mortality with treatment

Treatment	Mortality present		Mortality absent		Total	
	n	%	%	n	%	n
Simple closure of perforation	0	0	10	17.86	10	16.67
Resection-anastomosis	1	25	14	25	15	25
Loop ileostomy	3	75	32	57.17	35	58.33
Total	4	100	56	100	60	100
p-value	0.631					

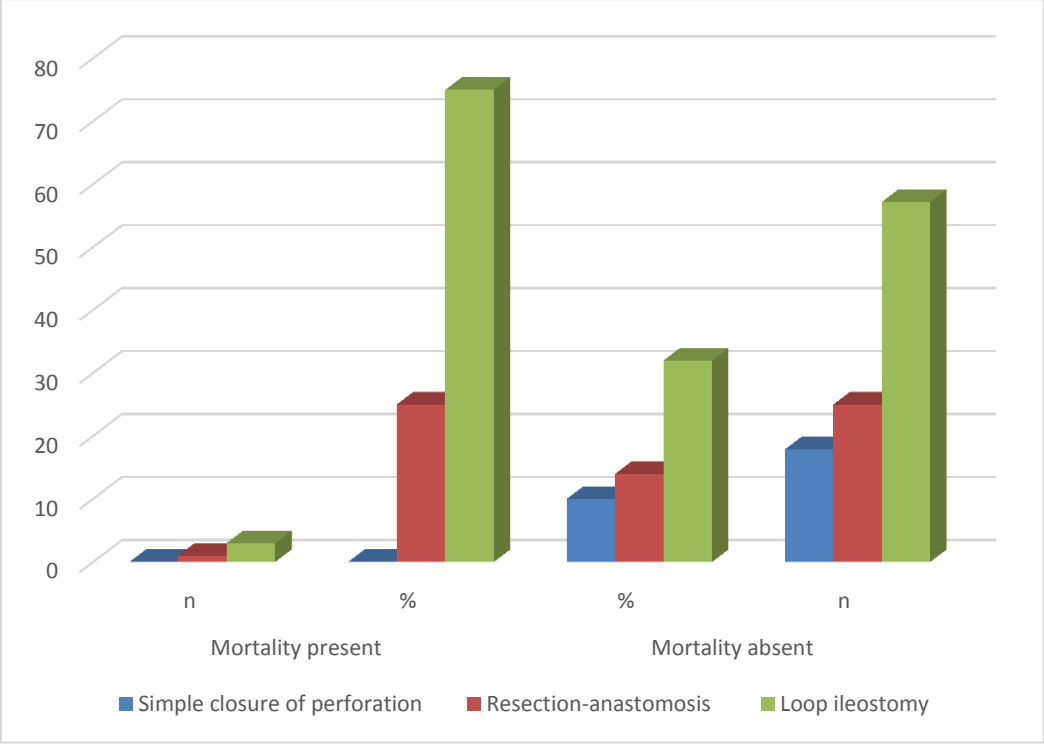


Figure 15: Correlation of mortality with treatment

Out of 4 mortality cases, three occurred in patients undergoing loop ileostomy while 1 occurred in resection-anastomosis patients. While analysing the results statistically, no significant correlation was seen among occurrence of mortality with type of treatment done among ileal perforation patients.

Table 16: Comparison of patients divided on the basis of time of presentation and age group

Age group (years)	Early presentation		Late presentation	
	Number	Percentage	Number	Percentage
≤30	7	15.2	4	28.6
31 to 40	11	23.9	3	21.4
41 to 50	15	32.6	5	35.7
51 to 60	8	17.4	1	7.1
More than 60	5	10.9	1	7.1
Total	46	100	14	100
p-value	0.735			

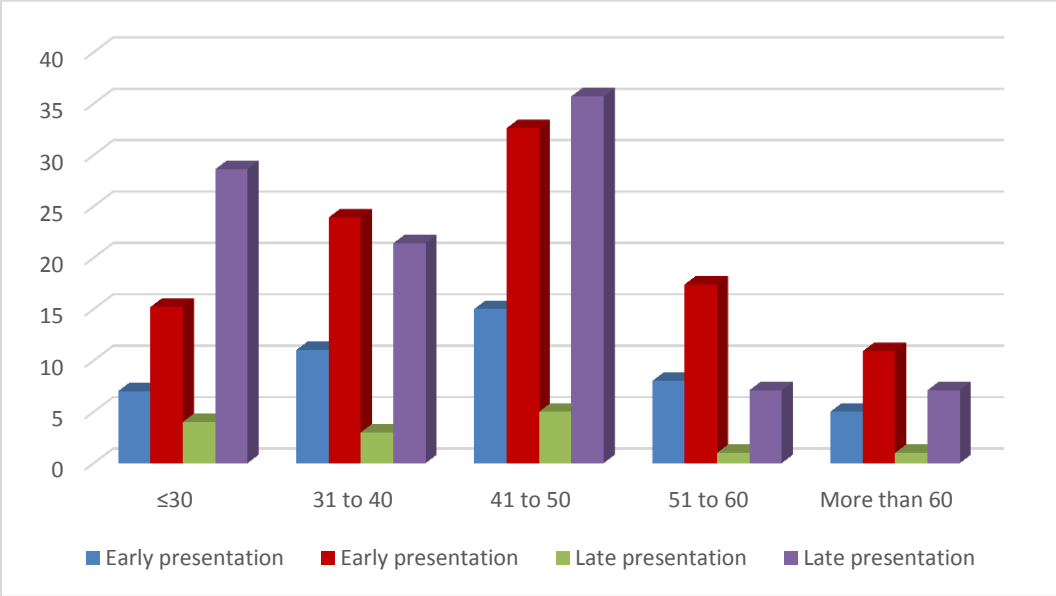


Figure 16: Comparison of patients divided on the basis of time of presentation and age group

32.6 percent of the patients of the early presentation group and 35.7 percent of the patients of the late presentation group belonged to the age group of 41 to 50 years. 23.9 percent of the patients of the early presentation group and 35.7 percent of the patients of the late presentation group belonged to the age group of 31 to 40 years. No significant results were obtained while correlating the age-wise distribution of patients with time of presentation (early and late presentation).

Table 17: Comparison of patients divided on the basis of time of presentation and gender

Gender	Early presentation		Late presentation	
	Number	Percentage	Number	Percentage
Males	11	23.9	6	42.9
Females	35	76.1	8	57.1
Total	46	100	14	100
p-value	0.168			

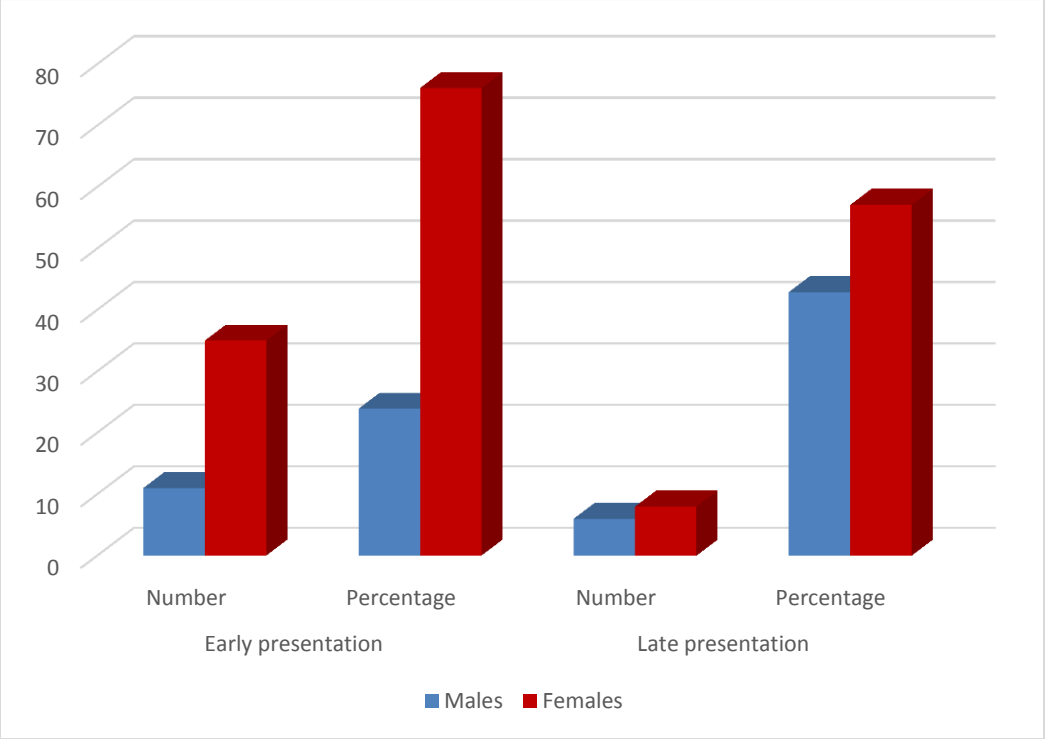


Figure 17: Comparison of patients divided on the basis of time of presentation and gender

76.1 percent of the patients of early presentation group and 57.1 percent of the patients of the late presentation group were females. No significant results were obtained while correlating the gender-wise distribution of patients with time of presentation (early and late presentation).

Table 18: Comparison of patients divided on the basis of time of presentation and presenting symptom

Presenting symptom	Early presentation		Late presentation		p-value
	Number	Percentage	Number	Percentage	
Abdominal pain	46	100	14	100	1
Constipation	38	82.6	14	100	0.179
Distension	46	100	14	100	1
Fever	33	71.7	10	71.4	0.982
Vomiting	25	54.3	6	42.9	0.451

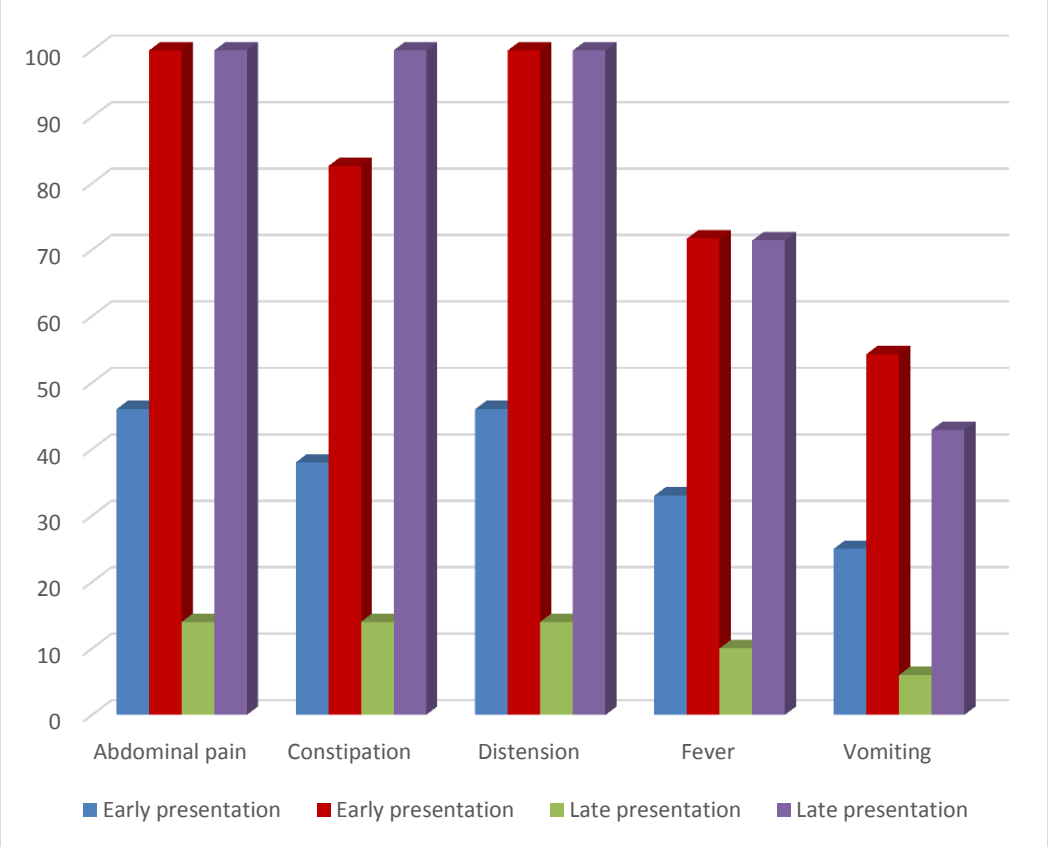


Figure 18: Comparison of patients divided on the basis of time of presentation and presenting symptom

Abdominal pain was seen in 100 percent of the patients each of early presentation group and late presentation group. Constipation was present in 82.6 percent of the patients of early presentation group and 100 percent of the patients of late presentation group. Distention was seen in 100 percent of the patients of both early presentation group and late presentation group. Fever was seen in 71.7 percent of the patients of early presentation group and in 71.4 percent of the patients of late presentation group. Vomiting was seen in 54.3 percent of the patients of early presentation group and in 42.9 percent of the patients of late presentation group. When analysed statistically, no difference was seen in terms of presenting symptoms among patients with early presentation and late presentation.

Table 19: Comparison of patients divided on the basis of time of presentation and number of perforations

Number of perforations	Early presentation		Late presentation		p-value
	Number	Percentage	Number	Percentage	
Single	34	73.9	11	78.6	0.724
Multiple	12	26.1	3	7.1	
Total	46	100	14	100	

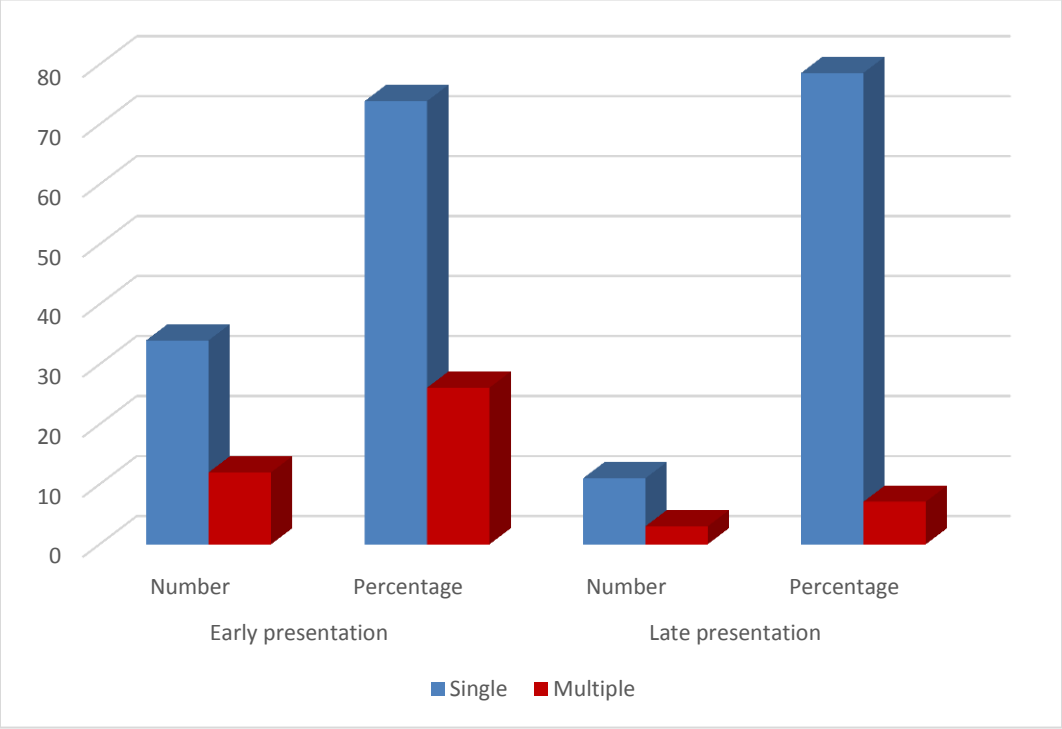


Figure 19: Comparison of patients divided on the basis of time of presentation and number of perforations

73.9 percent of the patients of early presentation group had single perforation while 78.6 percent of the patients of late presentation group had single presentation. While analysing statistically, no significant correlation was seen in terms of number of perforations among patients with early and late presentation.

Table 20: Comparison of patients divided on the basis of time of presentation and location of perforation

Distance from Ileocecal (IC) junction	Early presentation		Late presentation		p-value
	Number	Percentage	Number	Percentage	
Less than 10 cm	6	13	4	28.6	0.052
10 to 30 cm	19	41.3	1	7.1	
More than 30 cm	9	19.6	6	42.9	
Multiple	12	26.1	3	21.4	
Total	46	100	14	100	

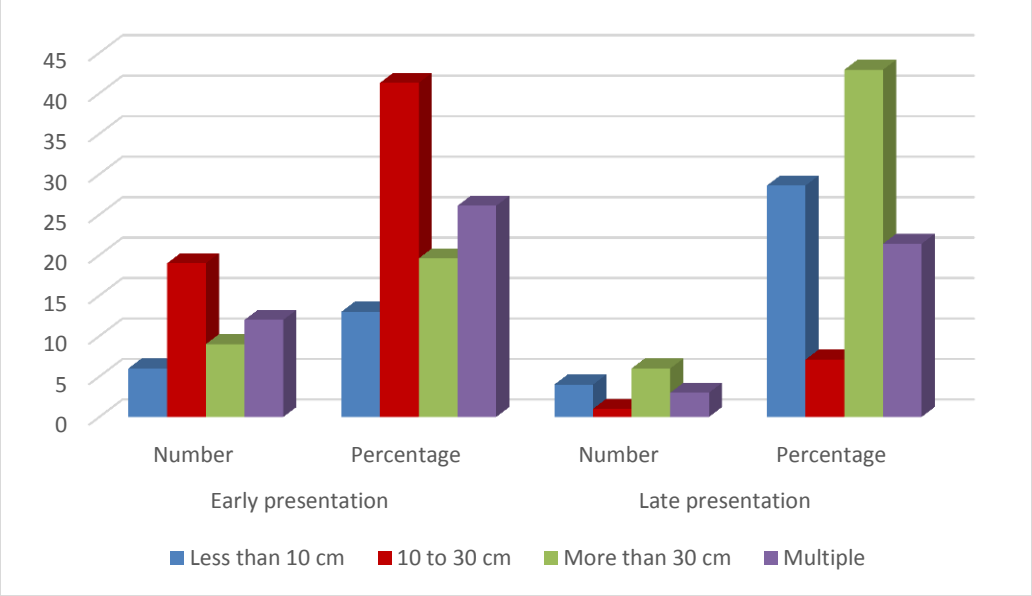


Figure 20: Comparison of patients divided on the basis of time of presentation and location of perforation

Among early presentation group, 41.3 percent of the patients had 10 to 30 cm distance of perforation from ileocecal junction while among patients of late presentation group, 42.9 percent of the patients had 10 to 30 cm distance of perforation from ileocecal junction. However; no significant pattern and results was seen while correlating location of perforation with time of presentation.

Table 21: Comparison of patients divided on the basis of time of presentation and comorbidities

Co-morbidities	Early presentation		Late presentation		p-value
	Number	Percentage	Number	Percentage	
Diabetes	2	4.3	1	7.1	0.674
Hypertension	4	8.7	1	7.1	0.854

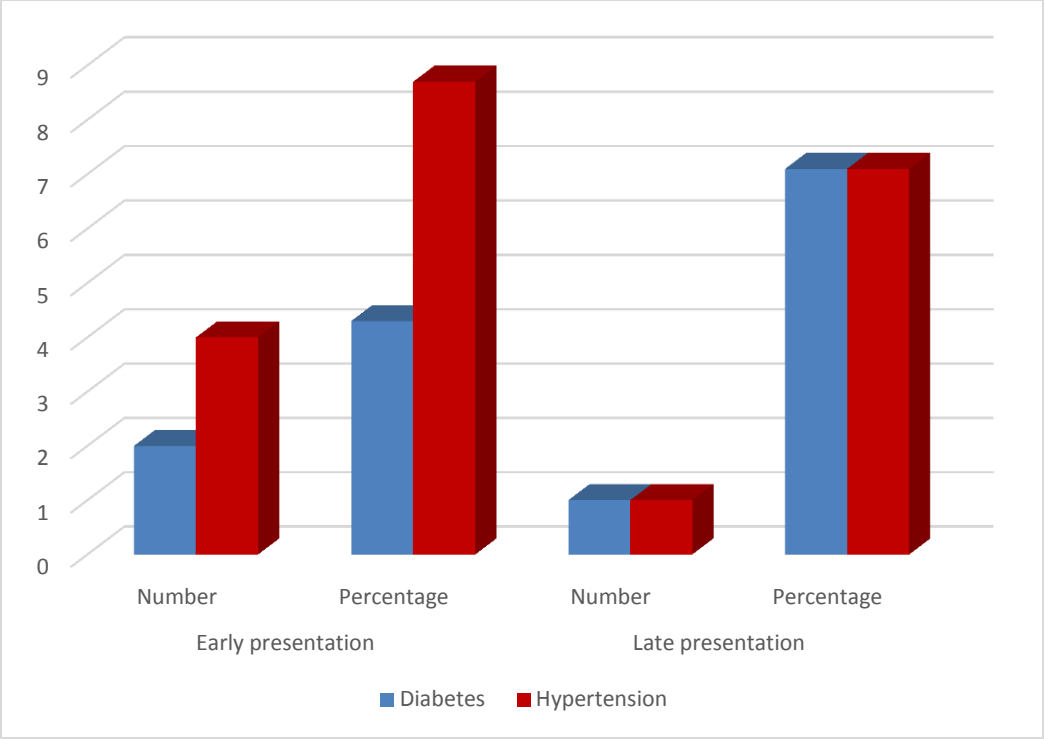


Figure 21: Comparison of patients divided on the basis of time of presentation and comorbidities

4.3 percent and 8.7 percent of the patients of early presentation group were diabetic and hypertensive respectively while 7.1 percent of the patients each of late presentation group were diabetic and hypertensive. While analysing statistically, no significant correlation was seen in terms of occurrence of comorbidities and time of presentation.

Table 22: Comparison of patients divided on the basis of time of presentation and etiology

Etiology	Early presentation		Late presentation		p- value
	Number	Percentage	Number	Percentage	
Typhoid	22	47.8	7	50	0.832
Tuberculosis	10	21.7	2	14.3	
Traumatic	8	17.4	2	14.3	
Non-specific	6	13	3	21.4	
Total	46	100	14	100	

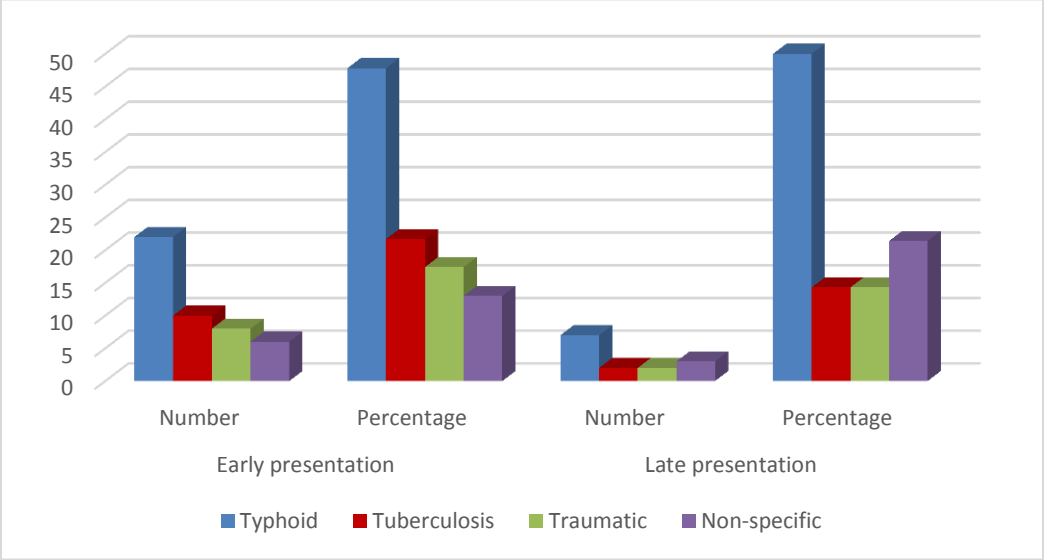


Figure 22: Comparison of patients divided on the basis of time of presentation and etiology

Among patients of early presentation group, 47.8 percent, 21.7 percent, 17.4 percent and 13 percent of the patients had etiologic profile of typhoid, tuberculosis, traumatic perforation and non-specific etiology respectively. Among patients of late presentation group, 50 percent, 14.3 percent, 14.3 percent and 21.4 percent of the patients had etiologic profile of typhoid, tuberculosis, traumatic perforation and non-specific etiology respectively. While analysing the results statistically, no significant pattern and correlation was seen among time of presentation with etiological profile of ileal perforation.

Table 23: Comparison of patients divided on the basis of time of presentation and treatment

Treatment	Early presentation		Late presentation		p-value
	Number	Percentage	Number	Percentage	
Simple closure of perforation	8	17.4	1	7.1	0.642
Resection-anastomosis	12	26.1	4	28.6	
Loop ileostomy	26	56.5	9	64.3	
Total	46	100	14	100	

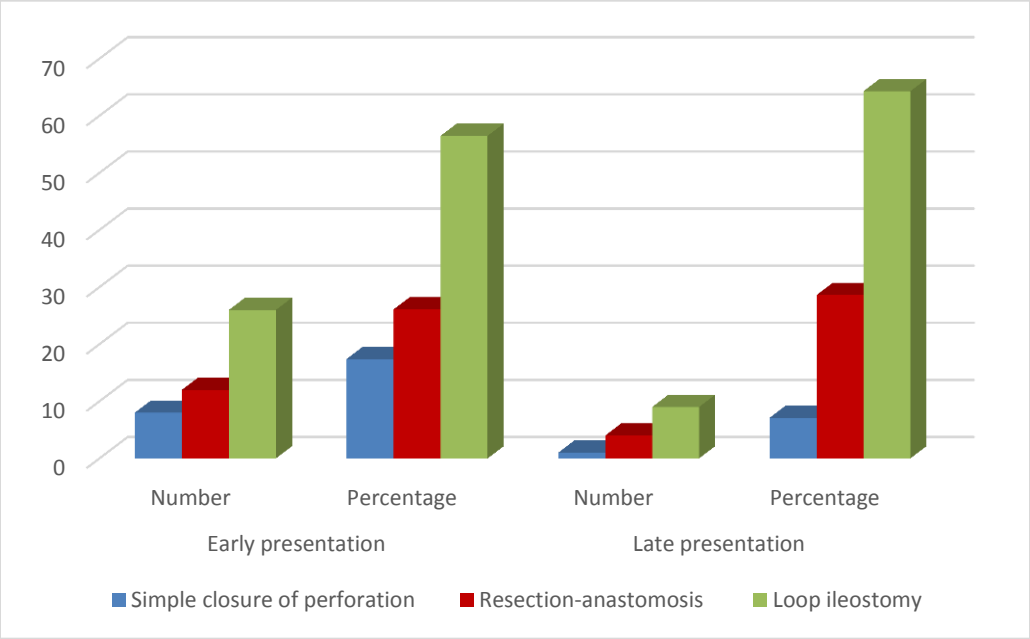


Figure 23: Comparison of patients divided on the basis of time of presentation and treatment

While comparing the patients divided on the basis of time of presentation and treatment, non-significant results were obtained.

Table 24: Comparison of patients divided on the basis of time of presentation and complications

Complications	Early presentation		Late presentation		p-value
	Number	Percentage	Number	Percentage	
Wound infection	8	17.4	0	0	0.193
Faecal fistula	5	10.9	0	0	
Anastomotic leak	1	2.2	0	0	
Intraabdominal abscess	1	2.2	0	0	
Absent	31	67.4	14	100	
Total	46	100	14	100	

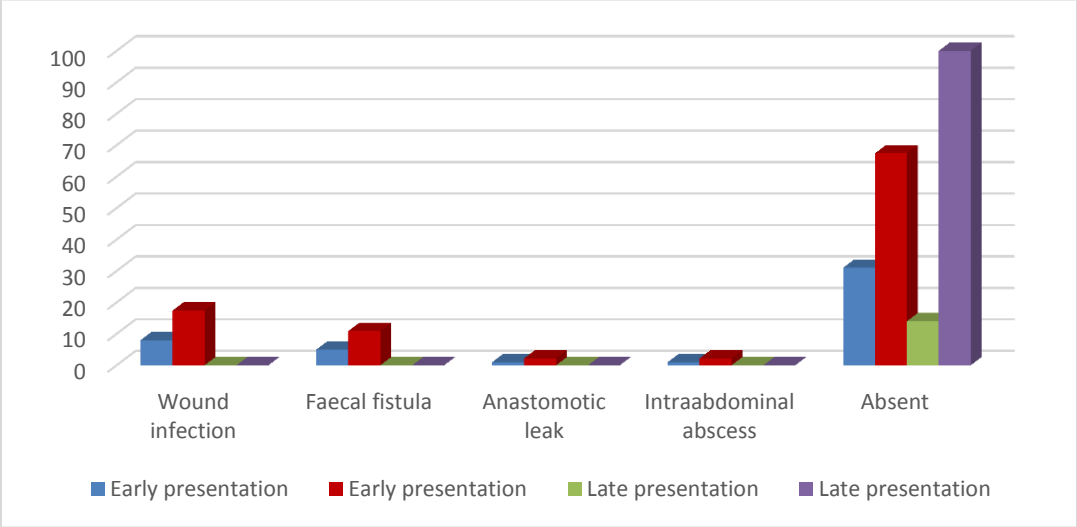


Figure 24: Comparison of patients divided on the basis of time of presentation and complications

Wound infection, faecal fistula, anastomotic leak and intraabdominal abscess was seen in 17.4 percent, 10.9 percent, 2.2 percent and 2.2 percent of the patients respectively of the early presentation group. Non-significant results were obtained while comparing the complications among patients of early and late presentation group.

Table 25: Comparison of patients divided on the basis of time of presentation and mortality

Mortality	Early presentation		Late presentation		p- value
	Number	Percentage	Number	Percentage	
Present	1	2.2	3	21.4	0.036*
Absent	45	97.8	11	78.6	
Total	46	100	14	100	

*: Significant

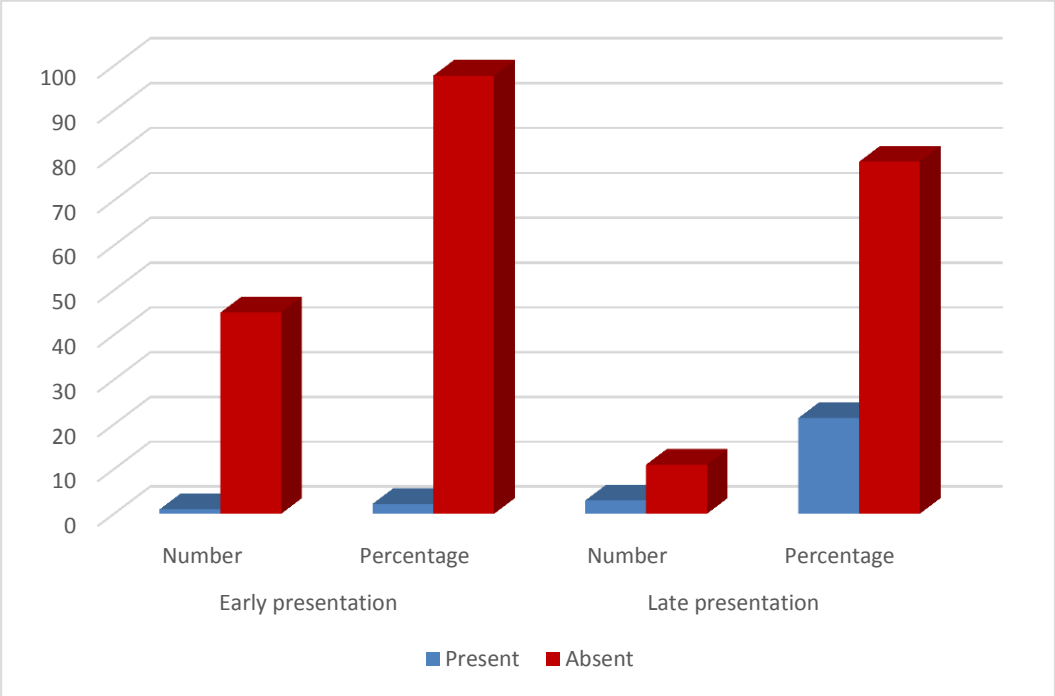


Figure 25: Comparison of patients divided on the basis of time of presentation and mortality

Mortality rate was significantly higher among patients of late presentation group (21.4 percent) in comparison to patients of early presentation group (2.2 percent).

DISCUSSION

Gastrointestinal perforation occurs when a hole forms all the way through the stomach, large bowel, or small intestine as a result of trauma, appendicitis, foreign bodies, parasitic infections, tuberculosis and tumours. The ileum is one of the commonest sites for perforations and has been associated with typhoid disease. The infection occurs when the typhoid bacterium accesses the human host through ingested food or drink and infects the Peyer's patches in the ileum leading to necrosis, ulcerations and perforations. Complications associated with perforations are usually fatal and could result in death if early surgical intervention is not offered.

Typhoid is the most common cause for this dreaded complication while tuberculosis, trauma, and nonspecific enteritis follow close suit. The incidence of perforation in typhoid fever has been reported to be 0.8% to 18%. Tuberculosis accounts for 5–9% of all small intestinal perforations in India and it is the second commonest cause after typhoid fever. These cases of perforation peritonitis often require ileostomy as a lifesaving measure (Verma H et al).[62]

Treatment is often dependent on resuscitation with fluids, electrolytes and administration of broad-spectrum antibiotics such as quinolones, third generation cephalosporins and metronidazole (Owusu Met al).[5]

Ileal perforation can also occur as a potentially fatal complication of enteric fever, which usually occurs by the third week of the disease when it is treated inadequately or left untreated. In general, intestinal hemorrhage and perforation tend to occur in the terminal ileum secondary to necrosis of Peyer patches. Mortality from ileal perforation due to typhoid fever has declined worldwide with the use of antibiotics, surgical care, and supportive therapy. Regular monitoring of factors related to this condition and measurement of outcome is useful in understanding the

pathophysiology and better management of the illness.[4-5] Hence; under the light of above-mentioned data, the present study was conducted for assessing the pattern and outcome of 60 patients with ileal perforations.

AGE

33.33 percent of the patients belonged to the age group of 41 to 50 years while 23.33 percent of the patients belonged to the age group of 31 to 40 years. 18.33 percent of the patients belonged to the age group of ≤30 years. Mean age of the patients with ileal perforation was 43.03 years. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a study conducted by Utaal MS et al; mean age of the patients with ileal perforation was 37.63 years.[78] In another study conducted by Ranjan P et al, mean age of the patients with ileal perforation was 34.4 years.[79] Shah, et al reported the mean age of the patients in the study was 33 years.[80] Mean age of the patients in another study conducted by Jain et al was 36.4 years.[81] Verma et al, in another study, reported the mean age of the patients to be 38.31 years.[62]

GENDER

Out of 60 patients with ileal perforation, 71.67 percent of the patients were males while the remaining were females. Our results were in concordance with the results obtained by previous authors who also reported male preponderance in their respective studies. In a study conducted by Utaal et al, out of 14 patients with ileal perforation, 71.43 percent of the patients were males while the remaining were females.[78] In another study conducted by Ranjan P et al, 77.1 percent of the patients were males while the remaining were females.[79] Poornima, et al observed that there were 81.3% males and 18.7% females among patients with ileal perforation.[1] Jain et al, in another study reported the male to female ratio to be 6.3: 1.[81] Shah, et al reported that ileal perforation were five times

more common in males as compared to females.[80] In another study conducted by Verma et al, 82.92 percent of the patients were males while

the remaining were females. This is possibly because males indulge in outdoor activities and are more prone to GI infections and its attendant complications including perforation peritonitis.[62]

PRESENTING SYMPTOMS

Among the 60 patients with ileal perforation, most common presenting complaint was abdominal pain and distension found to be present in 100 percent of the patients. Constipation, fever and vomiting was seen in 86.67 percent, 71.67 percent and 51.67 percent of the patients respectively. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a study conducted by Ranjan P et al, abdominal pain, constipation, distension, fever and vomiting was seen in 100 percent, 87.5 percent, 100 percent, 68.8 percent and 47.9 percent of the patients respectively.[79] Jain et al, in another study reported that abdominal pain and distension were seen in 100 percent of the patients.[81] In a study conducted by Verma et al, pain, vomiting, constipation, fever and abdominal distension was present in 100 percent, 92 percent, 73 percent, 85.3 percent and 78.1 percent of the patients.[62] Agu K et al, in another study, reported presence of fever, abdominal pain, vomiting, and abdominal distension in 96 percent, 90 percent, 78 percent and 70 percent of the patients respectively.[60]

TIME OF PRESENTATION

Majority of the patients with ileal perforation (76.67 percent) presented within 72 hours (early presenters) while 23.33 percent of the patients with ileal perforation presented after 72 hours (late presenters). Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a study conducted by Ranjan P et al, 68.8 percent and 31.2 percent of the patients with ileal perforation were early and late presenters respectively.[79]

NUMBER OF PERFORATIONS

Majority of the patients with ileal perforation (75 percent) had single perforation while 25 percent of the patients had multiple perforations. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a study conducted by Ranjan P et al,

64.6 percent and 35.4 percent of the patients with ileal perforation had single and multiple perforations respectively. Jha et al, in another study reported presence of single and multiple perforation in 85.7 percent and

14.3 percent of the patients respectively.[70,79]

LOCATION OF PERFORATION

Among the 60 patients with ileal perforation, 33.33 percent of the patients had perforation located at a distance of 10 to 30 cm from IC junction while it was more than 30 cm in 25 percent of the patients. In a study conducted by Jha et al, 35.71 percent of the patients had ileal perforation at a distance of 10 to 30 cm from IC junction while 28.57 percent of the patients had ileal perforation at a distance of more than 30 cm from IC junction.[79]

CO-MORBIDITIES

Diabetes and hypertension were seen in 20 percent and 25 percent of the patients respectively. In a previous study conducted by Verma et al, diabetes and hypertension were present in 5 percent and 8.33 percent of the patients with ileal perforation.[62]

ETIOLOGY

Typhoid was the chief etiologic factor responsible for ileal perforation, found to be present in 48.33 percent of the patients. Tuberculosis and traumatic cause of ileal perforation was seen in 20 percent and 16.67 percent of the patients respectively. In 15 percent of the patients, the cause was non-specific/unknown.Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a study conducted by Ranjan P et al, typhoid was the major etiologic factor for ileal perforation reported to be present in 39.6 percent of the patients. They observed presence of typhoid and traumatic cause in 16.7 percent and 10.4 percent of the patients.[79]

Kappikeri, et al found that typhoid was the most common cause of perforation (45%), followed by non- specific causes (42.5%), tuberculosis (7.5%) and traumatic injury (5%).[82] Poornima, et al reported that Typhoid (82.8%), nonspecific inflammation (9.4%), and tuberculosis (7.8%) were the major causes.[1] Shah, et al found that typhoid was the most common cause of nonspecific ileal perforations.[80]

In another previous study conducted by Verma et al, histopathologic analysis revealed nonspecific inflammation, typhoid perforation and tubercular inflammation in 56 percent, 24.4 percent and 19.5 percent of the patient respectively.[62]

Jha et al, in another study reported that typhoid fever was the etiologic factor in 48.3 percent of the cases while 44 percent of the ileal perforation cases were traumatic in origin.[70]

TREATMENT

Out of 60 patients with ileal perforation, loop ileostomy was done in 58.33 percent of the patients while simple closure of perforation and resection-anastomosis was done in 16.67 percent and 25 percent of the patients respectively. In a similar study conducted by Ranjan P et al, simple closure of perforation was done in 30% patients, resection – anastomosis was done in 20% and ileostomy proximal to simple closure/ resection-anastomosis was done in 50%.Simple layered closure of perforation in patients with single perforation of less than 2 cm with minimal contamination. In patients with large perforations or multiple perforations resection anastomosis was done.[79] Poornima, et al reported that Ileal perforation cases were mainly managed by simple closure of the perforation (74.6%) and primary resection and anastomosis (25.4%).[1]

Though surgery is accepted as the definite treatment, the choice of exact surgical procedure remains controversial. Most series report simple closure of the perforation or resection and anastomosis as choice of procedure. These procedures though appealing are not free of complications especially in an emergency setup. Of all the postoperative complications reported, faecal fistula remains the most life-threatening; the rate of its occurrence has been reported to be around twelve percent with a very high mortality rate. In view of this alarming situation, a shift in favour of a defunctioning protective ileostomy has been observed in recent years. Ileostomy is a lifesaving procedure, particularly in those cases where there are fulminant enteritis and generalized peritonitis of long duration (Verma et al).[62]

OUTCOME

Out of 60 patients with ileal perforation, mortality was seen in 6.67 percent of the patients while post-surgical complications were seen in 26.67 percent of the patients. Our results were in concordance with the results obtained by previous authors who also reported similar findings. Ranjan P et al, in a similar study reported the overall mortality rate among ileal perforation patients to be 10 percent.[79] In another study conducted by Jain et al, overall mortality rate was reported to be 17.1 percent. Overall complication rate in their study was reported to be 44.3 percent.[81] Verma et al, in their study, reported mortality rate of 7.3 percent.[62]

POSTSURGICAL COMPLICATIONS

Wound infection, Faecal fistula, anastomotic leak and intraabdominal abscess were seen as postsurgical complications in 13.33 percent, 8.33 percent, 3.33 percent and 1.67 percent of the patients respectively. In a study conducted by Jain et al, surgical site infection was the most common postsurgical complication.[81] Ranjan P et al, in another study reported presence of wound infection, chest infection, anastomotic leak and intraabdominal abscess in 35.4 percent, 25 percent, 12.5 percent and

10.4 percent of the patients respectively.[79] Verma et al, in their study, reported that in postoperative period, various complications seen were stomal discoloration (14.6%), peristomal skin excoriation (41.4%), wound sepsis (24.3%), intra-abdominal abscess (17%), and burst abdomen (4.8%). In another study conducted by Jha et al, wound sepsis, faecal fistula and septicaemia was seen in 72.03 percent, 14.4 percent and 9.3 percent of the patients respectively.[62]

CORRELATION OF ETIOLOGY WITH TYPE OF OPERATIVE PROCEDURE

While correlating the etiology with type of operative procedure, it was seen that in 62.07 percent and 83.33 percent of the patients with typhoid and tuberculosis as etiology, loop ileostomy was done while among 70 percent of the patients with traumatic etiology, resection anastomosis was done. While analysing the correlation statistically, significant results were obtained. Our results were in concordance with the results obtained by Jha et al who also reported similar findings. In their study, most common operative procedure followed in case of non-traumatic is loop ileostomy, 28 patients (49%) in typhoid and 4 cases (45%) in tuberculous because of associated with multiple perforation. In traumatic perforation resection and anastomosis was done in 33 cases (63%) followed by simple closure.[70] Nema A et al, in another study among ileal perforation patients due to typhoid reported that 7 cases (16%) undergone exploratory laparotomy with proximal loop ileostomy with primary closure and 6 (13%) were operated by exploratory laparotomy with resection anastomosis.[69]

MORTALITY WITH ETIOLOGY OF ILEAL PERFORATION

While analysing the correlation of mortality with etiology of ileal perforation, it was seen that mortality was present in 6.9 percent, 8.33 percent and 10 percent of the patients with typhoid, tuberculosis and traumatic etiology of ileal perforation. However; while analysing statistically, non-significant results were obtained. In a study conducted by Jha et al, overall mortality rate was 19% with high death rate in traumatic perforation (17 percent) due to presence of associated injury.[70]

An ileal perforation is a significant life-threatening condition with high morbidity and mortality that requires emergency surgery. Despite improvements in surgical and medical treatments, the overall mortality rate

has been reported in the past literature to be as high as thirty percent.Also, the mortality rate of cases that also have diffuse peritonitis is up to 70%. The rate of postoperative complications, such as complicated fluid collection, leakage, surgical site infection, and other systemic infections, is higher than for patients receiving elective abdominal surgeries. Various factors can cause intestinal perforation, including ischemic colitis, intestinal obstruction, stercoral perforation, infection, cancer, diverticulitis, trauma, and colonoscopy. Perforations due to cancer and infection have high mortality rates, but iatrogenic perforation during colonoscopy has a low mortality rate (Serpell JW et al, Kyllönen LE et al, Welch JP et al, Samalavicius NE et al, Shinkawa H et al). [83-87]

COMPARISON BETWEEN PATIENTS WITH EARLY AND LATE PRESENTATION

Non-significant results were obtained while comparing the age-wise and gender-wise distribution of patients among early and late presentation group. While comparing the clinical presentation, location of perforation and number of perforations among patients divided on the basis of time of presentation, significant results were obtained. Non-significant results were obtained while comparing the etiology, occurrence of comorbidities, treatment and complications among patients divided on the basis of time of presentation.

Mortality rate was significantly higher among patients of late presentation group (21.4 percent) in comparison to patients of early presentation group (2.2 percent). Our results were in concordance with the results obtained by Shankar PS et al who also reported similar findings. In their study, mortality of those who presented after 48 hours was high and no mortality in those who presented early. Adequate preoperative resuscitation with correction of fluid and electrolyte derangement forms the centre stage of

treatment.[88] In another similar study conducted by Ugochukwu AI et al, the group with gross pathological changes seen mainly in patients that presented late had higher mortality rates, even as high as 50%.[89] Late presentation results in extensive pathological changes in the terminal ileum and caecum which contribute to higher morbidity and mortality (Ajao OG).[90] Adesunkanmi AR et al, in another previous study, reported that late presentation and delay in operation affected the mortality rate.[91]

Hence; ileal perforation is associated with high mortality and many patients present in a severe toxic state because of delay in diagnosis and late presentation to hospital.

In a similar study conducted by Ansari AG et al, authors evaluated patients with presence of typhoid associated ileal perforation. Fever with abdominal pain and distension were the symptoms in all subjects followed by diarrhoea, vomiting and constipation Widal test more than 1:320 was positive in 35(79.45%) cases and typhi dot (IgM in all cases and IgG in 15) was positive in all cases. Blood culture was positive in 32 (72.7%) cases. X-ray abdomen revealed pneumoperitoneum in 22 (50%) cases. Ultrasound shows free peritoneal collection in 40 (90.90%) cases. On operation the abdominal cavity was heavily contaminated in 12 (27.27%) patients while in 32 (72.72%) patients the peritoneal cavity was having moderate contamination. 36 (81.81%) patients had single perforation & 8 (18.18%) patients had more than one perforation. In 32 (72.72%) patients perforations after freshening the ulcer were closed by single layered interrupted extra mucosal technique with vicryle 2/0, 4 (9.09%) needed resection & anastomosis & in remaining 8 (18.18%) loop ileostomy was made.[87]

In another similar study conducted by Begam et al, authors assessed post-operative mortality after ileal perforation. Out of 53 patients having postoperative complications 38 patients were survived and 15 patients were expired. So total survivors were 85% and non-survivors 15%. In their study most of the mortality (12%) was attributed to septicemia and mode of death was multiple organ failure. Respiratory complications caused 2% mortality one patient died of ARDS and another elderly patient with preexisting bronchial asthma developed respiratory failure and was unresponsive to treatment. One death was related to faecal fistula followed by severe fluid, electrolyte and acid-base imbalance with peritonitis and gross sepsis. They concluded that the mortality is significantly high due to septicemia, ARDS and faecal fistula.[92]

SUMMARY & CONCLUSION

The present study was conducted for assessing the pattern and outcome of 60 patients with ileal perforations. Following results are obtained:

- 33.33 percent of the patients belonged to the age group of 41 to 50 years while 23.33 percent of the patients belonged to the age group of 31 to 40 years. 18.33 percent of the patients belonged to the age group of ≤30 years. Mean age of the patients with ileal perforation was 43.03 years.
- Out of 60 patients with ileal perforation, 71.67 percent of the patients were males while the remaining were females.
- Among the 60 patients with ileal perforation, most common presenting complaint was abdominal pain and distension found to be present in 100 percent of the patients. Constipation, fever and vomiting was seen in 86.67 percent, 71.67 percent and 51.67 percent of the patients respectively.
- Majority of the patients with ileal perforation (76.67 percent) presented within 72 hours (early presenters) while 23.33 percent of the patients with ileal perforation presented after 72 hours (late presenters).
- Majority of the patients with ileal perforation (75 percent) had single perforation while 25 percent of the patients had multiple perforations.
- Among the 60 patients with ileal perforation, 33.33 percent of the patients had perforation located at a distance of 10 to 30 cm from IC junction while it was more than 30 cm in 25 percent of thepatients.
- Diabetes and hypertension were seen in 20 percent and 25 percent of the patients respectively.
- Typhoid was the chief etiologic factor responsible for ileal perforation, found to be present in 48.33 percent of the patients. Tuberculosis and traumatic cause of ileal perforation was seen in 20 percent and 16.67 percent of the patients respectively. In 15 percent of the patients, the cause was non-specific/unknown.
- Out of 60 patients with ileal perforation, loop ileostomy was done in 58.33

percent of the patients while simple closure of perforation and resection-anastomosis was done in 16.67 percent and 25 percent of the patients respectively.

- Out of 60 patients with ileal perforation, mortality was seen in 6.67 percent of the patients while post-surgical complications were seen in 26.67 percent of the patients.
- Wound infection, Faecal fistula, anastomotic leak and intraabdominal abscess were seen as postsurgical complications in
  13.33 percent, 8.33 percent, 3.33 percent and 1.67 percent of the patients respectively.
- While correlating the etiology with type of operative procedure, it was seen that in 62.07 percent and 83.33 percent of the patients with typhoid and tuberculosis as etiology, loop ileostomy was done while among 70 percent of the patients with traumatic etiology, resection anastomosis was done. While analysing the correlation statistically, significant results were obtained.
- While analysing the correlation of mortality with etiology of ileal perforation, it was seen that mortality was present in 6.9 percent,
  8.33 percent and 10 percent of the patients with typhoid, tuberculosis and traumatic etiology of ileal perforation. However; while analysing statistically, non-significant results were obtained.
- Out of 8 patients with wound infection, simple closure of perforation was done in 50 percent of the patients while resection-anastomosis and loop ileostomy were done in 37.5 percent and 12.5 percent of the patients respectively. Out of 5 patients with faecal fistula, simple closure of perforation was done in 60 percent of the patients while resection-anastomosis and loop ileostomy were done in 20 percent of the patients each. Both the cases of anastomotic leak were seen. in patients undergoing resection-anastomosis. Single case of intraabdominal abscess was reported in patients undergoing treatment by simple closure by perforation. Non-significant results were obtained while correlating

complications with treatment.

- Out of 4 mortality cases, three occurred in patients undergoing loop ileostomy while 1 occurred in resection-anastomosis patients. Non-significant results were obtained while correlating mortality with treatment.
- Non-significant results were obtained while comparing the age-wise and gender-wise distribution of patients among early and late presentation group. While comparing the clinical presentation, location of perforation and number of perforations among patients divided on the basis of time of presentation, significant results were obtained. Non-significant results were obtained while comparing the etiology, occurrence of comorbidities, treatment and complications among patients divided on the basis of time of presentation.
- Mortality rate was significantly higher among patients of late presentation group (21.4 percent) in comparison to patients of early presentation group (2.2 percent).

From the above results, following conclusion can be withdrawn:

- The ileal perforation is commonly seen in third and fourth decade of life with high male preponderance. Abdominal pain and distension are seen in all cases. Typhoid and tuberculosis account for majority of the cases.
- ileal perforation is associated with high mortality among patients with late presentation to hospital.
- Appropriate tests, mainly radiology must be done to rule out the same. Early identification and adequate management of etiologic factor is helpful in preventing perforations.
- The risk of surgical site infection is high in these cases and proper preventive measures must be taken for that. However; further studies are recommended for better exploration of results.

BIBLIOGRAPHY

1. Poornima R, Venkatesh KL, Goutham MV, Hassan N. Clinicopathological study of Ileal perforation: study in tertiary center. International Surgery Journal. 2017;4:543-9.
2. Singh G, Dogra BB, Jindal N, Rejintal S. Non-traumatic ileal perforation: a retrospective study. J Family Med Prim Care. 2014;3:132-5
3. Evert JA, Black BM, Dockerty MB. Primary nonspecific ulcers of the small intestine. Surgery. 1948;23:185–200.
4. Finkbiner RB, Decker JP. Ulceration and perforation of the intestine due to necrotizing arteriolitis. N Engl J Med. 1963;268:14–8.
5. Owusu M, Marfo K, Osei I, Amuasi J, Sarpong N. An Ileal Perforation Associated with Extended Spectrum β-Lactamases-Producing Escherichia Coli: Medical Case Report. Clin Med Rev Case Rep.2016; 3:140.
6. Bill JG, Smith Z, Brancheck J, Elsner J, Hobbs P, Lang GD et al. The importance of early recognition in management of ERCP-related perforations. Surgical endoscopy. 2018;32:12.
7. Wang H, Li A, Shi X, Xu X, Wang H, Wang H, et al. [Diagnosis and treatment of iatrogenic colonoscopic perforation]. Zhonghua wei chang wai ke za zhi = Chinese journal of gastrointestinal surgery. 2018;25;28-31.
8. Paolantonio P, Rengo M, Ferrari R, Laghi A. Multidetector CT in emergency radiology: acute and generalized non-traumatic abdominal pain. The British journal of radiology. 2016; 24034035
9. Krüger PC, Mentzel HJ. Radiological evaluation of acute abdomen in children. Der Radiologe. 2019;59:146-53.
10. Crump JA, Luby SP, Mintz ED. The global burden of typhoid fever. Bull World Health Organ. 2004;82:346–53.
11. Chang YT, Lin JY, Huang YS. Typhoid colonic perforation in childhood: a ten-year experience. World J Surg. 2006;30:242–7.

12. Mallick S, Klein JF. [Management of typhoid perforation of the small bowel: a case series in Western French Guiana] Med Trop (Mars) 2001;61:491–4.
13. Chatterjee H, Jagdish S, Pai D, Satish N, Jayadev D, Reddy PS. Changing trends in outcome of typhoid ileal perforations over three decades in Pondicherry. Tropical Gastroenterology: Official Journal of the Digestive Diseases Foundation. 2001;22:155-8.
14. Ray P, Gupta HN, Roy M. Sushruta Samhita. Indian Science Academy. N. K.Gossain and Co. (Pvt.) Ltd., 1980, 338
15. Zachary Cope. A History of Acute Abdomen. 2nd Edition, Oxford University Press,1965,12.
16. Zachary Cope. A History of Acute Abdomen. 2nd Edition, Oxford University Press,1965,58
17. Zachary Cope. A History of Acute Abdomen. 2nd Edition, Oxford University Press,1965,4.
18. Collins JT, Nguyen A, Badireddy M. Anatomy, Abdomen and Pelvis, Small Intestine. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459366/
19. Fish EM, Burns B. Physiology, Small Bowel. [Updated 2022 Oct 9]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532263/
20. PDQ Adult Treatment Editorial Board. Small Intestine Cancer Treatment (PDQ®): Patient Version. 2022 Oct 7. In: PDQ Cancer Information Summaries [Internet]. Bethesda (MD): National Cancer Institute (US); 2002-. [Figure, The small intestine connects the...] Available from: https://www.ncbi.nlm.nih.gov/books/NBK66026/figure/CDR0000350260__184/

21. Burke G, Nichols L, Balogh K, Hammer S, Jensen W, Pomposelli F, et al. Perforation of the terminal ileum with cytomegalovirus vasculitis and Kaposi's sarcoma in a patient with aquired immunodeficiency syndrome. Surgery. 1987;102:540-5.
22. Shackelford ‘s surgery of the alimentary tract , 6th edition , Chapter 67.
23. Schwartz principles of surgery, 9th edition , chapter 28
24. Karmakar SR, Dwivedi Dr, Bhalerao RA. Perforations of terminal ileum. Indian Journal of Surgery, 1972; 34: 422-6.
25. Bitar R, Tarpley J. Intestinal perforation in typhoid fever: a historical and state-of the-art review. Rev Infect Dis. 1985;7:257-71.
26. Kim JP, Oh SK, Jarrett F. Management of ileal perforation due to typhoid fever. Ann Surg. 1975;181:88-91
27. Keenan JP, Hadley GP. The surgical management of typhoid perforation in children.Br J Surg. 1984;71:928-9.
28. Santillana M. Surgical complications of typhoid fever: enteric perforation.World J Surg. 1991;15:170-5.
29. Archampong EQ. Typhoid ileal perforations: why such mortalities? Br J Surg. 1976;63:317-21.
30. Swadia ND, Trivedi PM, Thakkar AM. The problem of enteric ileal perforation. Indian Journal of Surgery. 1979; 41: 643-51.
31. Gibney EJ, Typhoid perforation. Br J Surg, 1989; 76: 887-9.
32. Washington C Winn Jr., John M Kissane. Bacterial Diseases. In : Ivan Damjanov,James Linds, Eds. Anderson’s Pathology, 10th Edition, Missouri, Mosby, 1996;788-9.
33. France von Lictenberg. Infectious diseases. In Ramji S Cotran, Vinay Kumar, Stanley L Robbins Eds. Robbin’s Pathologic Basis of Disease, 4th Edition. Philadelphia, W.B.Saunder’s Company, 1989; 354.
34. Kaul BK. Operative management of typhoid perforation in children. Int Surg. 1975;60:407-10.

35. Gerald T Keusch. Salmonellosis. In Fauci AS, eds. Harrison's Principles of Internal Medicine. 12th Edition, McGraw Hill, 1991; 610-611.
36. Ananthanarayan R, Jayaram Paniker CK. Enterobacteriaceae III – Salmonella.Textbook of Microbiology, 4th Edition, Madras, Orient Longman, 1994, 285.
37. Huckstep RL. Recent advances in the surgery of typhoid fever. Ann Roy Coll Surg Eng, 1960;26:207-230.
38. Hook EW, Guerrant RL. Salmonellosis. In Wintrobe MM, eds. Harrison's Principles of Internal Medicine. 7th Edition, McGraw Hill, 1977; 843.
39. Gulati PD, Saxena SN, Bact D, Gupta DS, Chuttani HK. Changing pattern of typhoid fever. Am J Surg, 1968; 45:544-8.
40. Talwar S, Sharma RK, Mittal DK, Prasad P. Typhoid enteric perforation. Aust N Z J Surg. 1997;67:351-3.
41. Ameh EA, Dogo PM, Attah MM, Nmadu PT. Comparison of three operations for typhoid perforation.Br J Surg. 1997;84:558-9.
42. Zachary Cope. A History of Acute Abdomen. 2nd Edition, Oxford University Press,1965,4.
43. Kala RP, Asopa HS, Mathur SK, Arti SP. Resection and Ileotransverse colostomy for enteric perforation of terminal ileum. Ind J Surg, 1978;40:674 -8.
44. Donald E Meier, Obioha O, Imediegwu, John L Tarlpley. Perforated typhoid enteritis:Operative Experience with108 cases. Am J Surg, 1989;157:423-7.
45. Eduardo Lizzaralde A. Typhoid perforation of ileum in children. J Pediar Surgery,1981;16:1012-6.
46. Paran H, Neufeld D, Shwartz I, Kidron D, Susmallian S, Mayo A, et al. Perforation of the terminal ileum induced by blast injury: delayed diagnosis or delayed perforation? J Trauma. 1996;40:472-5.

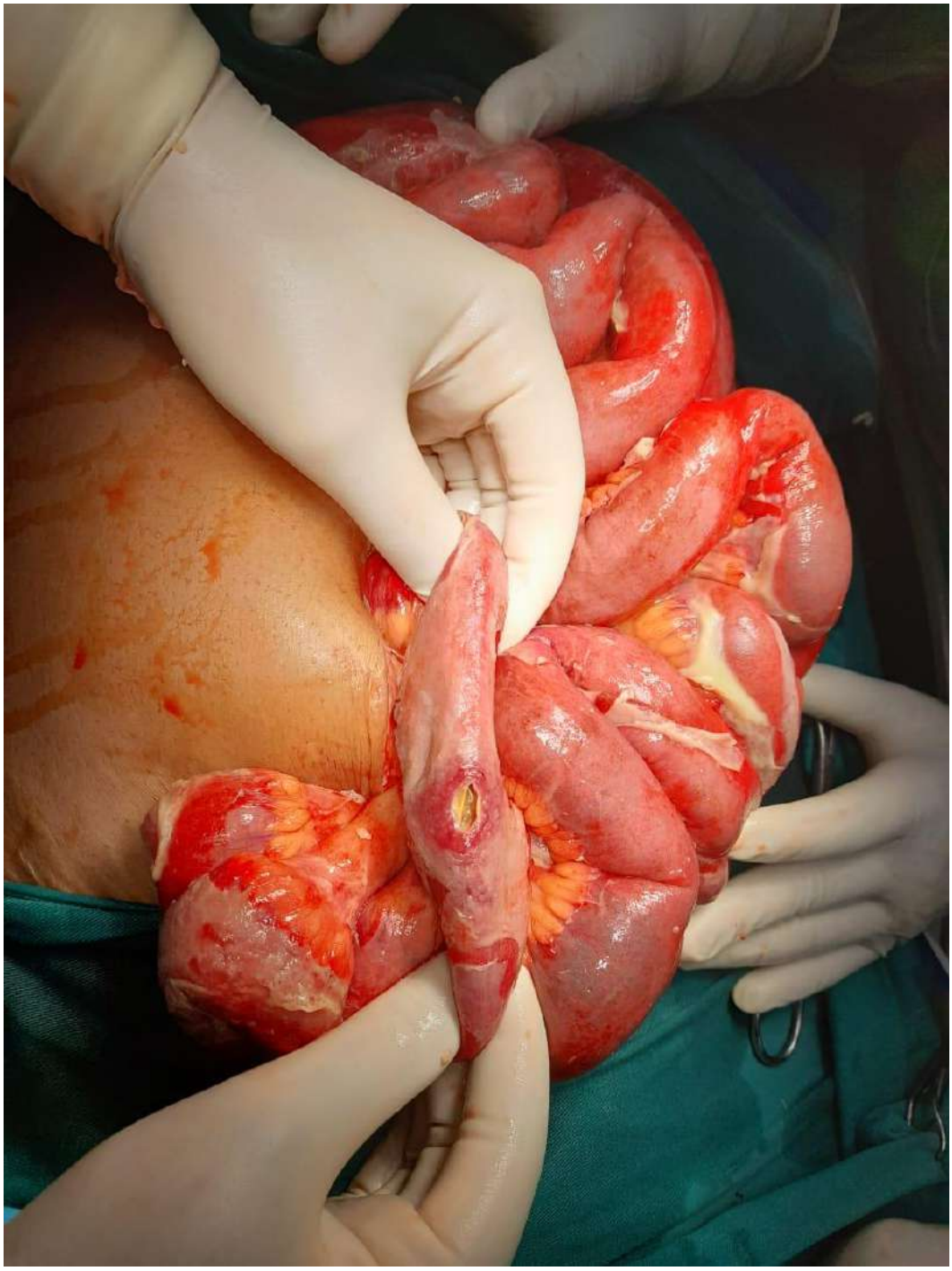
47. Chaiko F. Non-traumatic perforation of small bowel. American Journal of Surgery. 1987;153:355-8.
48. Dixon JM, Lamusden AM, Piris J. Small Bowel Perforation. Journal of the Royal College of Surgeons of Edinburgh, 1985;30:43-6.
49. David M Steinberg, Trevor Cooke W, Alexander Williams J. Free perforation in Crohn's disease. Gut, 1973;14:187-190.
50. Menguy R. Surgical management of free perforation of small intestine complicating regional enteritis. Ann Surg, 1972;175:178-189.
51. Huttunen R, Kairaluoma MI, Mokka RE, Larmi TK. Nontraumatic perforations of the small intestine. Surgery. 1977;81:184-8.
52. Nadkarni KM, Shetty SD, Kagzi RS, Bhalerao RA. Small bowel perforation. A study of 32 cases. Archives of Surgery, 1981; 116: 53-7.
53. Remine SG, Mcilrath DC. Bowel perforation in steroid-treated patients. Annals of surgery. 1980;192:581-6.
54. Chatterjee H, Jagdish S, Pai D, Satish N, Jayadev D, Reddy PS. Changing trends in outcome of typhoid ileal perforations over three decades in Pondicherry. Tropical Gastroenterology: Official Journal of the Digestive Diseases Foundation. 2001;22:155-8.
55. Capoor MR, Nair D, Chintamani MS, Khanna J, Aggarwal P, Bhatnagar D. Role of enteric fever in ileal perforations: an overstated problem in tropics?. Indian journal of Medical microbiology. 2008;26:54-7.
56. Ekenze SO, Okoro PE. Typhoid ileal perforation: Analysis of morbidity and mortalityin 89 children. Nigerian journal of clinical practice. 2008;11:59-63.
57. Nuhu A, Dahwa S, Hamza A. Operative management of typhoid ileal perforation in children. African Journal of Paediatric Surgery. 2010;7:9.

58. Tade AO, Olateju SO, Osinupebi OA, Salami BA. Typhoid Intestinal Perforations in a Tropical Tertiary Health Facility: A Prospective Study. East and Central African Journal of Surgery. 2011;16:72-9.
59. Patil V, Vijayakumar A, Ajitha MB, Kumar L. Comparison between tube ileostomy and loop ileostomy as a diversion procedure. International Scholarly Research Notices. 2012;2012.
60. Agu K, Nzegwu M, Obi E. Prevalence, morbidity, and mortality patterns of typhoid ileal perforation as seen at the University of Nigeria Teaching Hospital Enugu Nigeria: an 8-year review. World Journal of Surgery. 2014;38:2514-8.
61. Mittal S, Singh H, Munghate A, Singh G, Garg A, Sharma J. A comparative study between the outcome of primary repair versus loop ileostomy in ileal perforation. Surgery Research and Practice. 2014.
62. Verma H, Pandey S, Sheoran KD, Marwah S. Surgical audit of patients with ileal perforations requiring ileostomy in a Tertiary Care Hospital in India. Surgery research and practice. 2015.
63. Srihari G, Sudheer D. Study of prognostic factors and outcomes in ileal perforations. J Evid Based Med Healthc. 2016;3:4911-7.
64. Oseni-Momodu EO, Chima AA, Ushie AP. Pattern of typhoid presentations in children and surgical outcomes of perforated cases in a tertiary centre in North Central, Nigeria. Nigerian Journal of Family Practice. 2017;8:23-30.
65. Aliyu S, Babayo UD, Tahir MB, Zarami AB, Ibrahim AG, Madziga AG. Typhoid Perforation: Presentation and Management Outcome North-Eastern Nigeria. J Gastrointest Dig Syst. 2017;7:2.
66. Ch B, Chourashiya BK, Porwal S, Porwal V, Gupta A. A clinical study of the spectrum of gastro intestinal perforation peritonitis in rural Southern East Rajasthan. Journal of universal surgery. 2017;5:8- 12.

67. Mallik NR, Ray SD, Saha AK, Das C. Study of Spectrum of Small Bowel Perforations–Management and Evaluation of Outcomes. IOSR J Dent Med Sci. 2018;7:64-8.
68. Hameed F, Shah FH, Hanif M. Clinical Pattern and Management of Typhoid Ileal Perforation. Journal of Islamabad Medical & Dental College. 2018;7:140-4.
69. Nema AA, Darshan JR. A study of surgical approach to typhoid ileal perforation at a tertiary care hospital of South Gujarat, India. International Surgery Journal. 2018;5:1758-62.
70. Jha PK, Chandran R, Jaiswal P, Kumar A, Seema K, Singh DK, et al. Pattern of ileal perforation in our experience; a tertiary care centre in Eastern India. International Surgery Journal. 2018;5:2081-5.
71. Singla S, Verma S, Garg P, Verma A, Noori MT, Yadav A. Pattern and etiology of patients with gastrointestinal perforations: an observational prospective study. Int J Contemp Med Res. 2019;6:6-9.
72. Qazi SH, Yousafzai MT, Saddal NS, Dehraj IF, Thobani RS, Akhtar A, et al. Burden of Ileal Perforations Among Surgical Patients Admitted in Tertiary Care Hospitals of Three Asian countries: Surveillance of Enteric Fever in Asia Project (SEAP), September 2016–September 2019. Clinical Infectious Diseases. 2020;71:232-8.
73. Chukwubuike KE. Typhoid Intestinal Perforation in Children: Still a Persistent Problem in a Developing Country. Clinical Surgery Research Communications. 2020;4:26-31.
74. Das PK, Rahman CM, Rahman AM, Dewan MN, Islam MM, Saha KK, et al. Aetiological Pattern of Gastrointestinal Perforations: A Prospective Observational Study. Journal of Dhaka Medical College. 2020;29:106-9.
75. Abo-Halawa NA, Negm MA, Fathy M. The pattern of neonatal gastro-intestinal perforation in upper Egypt. Annals of Pediatric Surgery. 2020;16:1-6.

76. Kabongo KM, Erzingatsian K. Early postoperative complications associated with perforation. Annals of Pediatric Surgery. 2020;16:1-6.
77. Alla S, Choudhary R, Middha S, Salim M. Epidemiological study of ileal perforation in patients presenting to tertiary care centre in north western Rajasthan: Epidemiological study of ileal perforation. Asian J Pharm Clin Res. 2022;15:75-7.
78. Utaal MS, Bali S, Batra P, Garg N. Clinical profile in cases of intestinal perforation. Int Surg J 2017;4:1002-8.
79. Ranjan P, Ansari MA. Study of profile of cases and complications of ileal perforation at KMCH, Katihar. IAIM, 2019;6:74-8.
80. Shah S, Gandhi JP. Role of ileostomy in enteric perforation. IJSS Journal of Surgery, 2015;1:10-5.
81. Jain S, Meena LM, Ram P. Surgical management and prognosis of perforation secondary to typhoid fever. Tropical Gastroenterology, 2016;37:123-8.
82. Serpell JW, Nicholls RJ. Stercoral perforation of the colon. Br J Surg. 1990;77:1325–29.
83. Kyllönen LE. Obstruction and perforation complicating colorectal carcinoma. An epidemiologic and clinical study with special reference to incidence and survival. Acta Chir Scand. 1987;153:607–14.
84. Welch JP, Donaldson GA. Perforative carcinoma of colon and rectum. Ann Surg. 1974;180:734-40.
85. Samalavicius NE, Kazanavicius D, Lunevicius R, Poskus T, Valantinas J, Stanaitis J, et al. Incidence, risk, management, and outcomes of iatrogenic full-thickness large bowel injury associated with 56,882 colonoscopies in 14 Lithuanian hospitals. Surg Endosc. 2013;27:1628–35.
86. Shinkawa H, Yasuhara H, Naka S, Yanagie H, Nojiri T, Furuya Y, et al. Factors affecting the early mortality of patients with nontraumatic colorectal perforation. Surg Today. 2003;33:13–7.

87. Ansari AG, Naqvi SQH, Ghumro AA, Jamali AH, Talpur AA. Management of typhoid ileal perforation: A surgical experience of 44 cases. Gomal Journal of Medical Sciences January-June 2009;7: 27-30.
88. Shankar PS, Sudarshan PB, Sundaravadanan BS. Analysis of enteric ileal perforation: a prospective study in a tertiary care hospital. Int Surg J 2017;4:899-902.
89. Ugochukwu AI, Amu OC, Nzegwu MA. Ileal perforation due to typhoid fever – Review of operative management and outcome in an urban centre in Nigeria. International J Surg. 2013;11:218- 22.
90. Ajao OG. Typhoid perforation: factors affecting mortality & morbidity. Int Surg, 1982; 67:317-9.
91. Adesunkanmi AR, Ajao OG. The prognostic factors in typhoid ileal perforation: a prospective study of 50 patients. Journal of the Royal College of Surgeons of Edinburgh, 1997;42:395–9.
92. Begum M, Majid M, Mohammad D, Begum W, Yusuf M, Sultana S. Post-Operative Mortality after Ileal Perforation at a Teaching Hospital in Dhaka City. Surgical Science, 2020;11;25-31.



Picture 1 - Ileal perforation

Picture 2 - Enterocutaneous fistula

Figure 3 - Wound dehiscence

PROFORMA

SR. NO. ……..

MRD NO. :…….

NAME: …….. AGE: ……..

SEX: ……..

ADDRESS……..

DOA …….. DOD……..

STAY: ……..

HISTORY

CHIEF COMPLAINTS ……..

SYMPTOMS ….. PRESENT/ABSENT …. DURATION ……

ABDOMINAL PAIN……..

FEVER……..

VOMITING……..

CONSTIPATION……..

LOOSE STOOLS……..

OTHERS……..

Signature of Candidate **Signature of Supervisor**

PAST HISTORY

DIABETES MELLITUS……..

TUBERCULOSIS……..

HYPERTENSION…….

HISTORY OF ANY SURGERY……..

EXAMINATION

PR …….. BP……..

RR……..

TEMP…….. HYDRATION ……..

PALLOR……..

JAUNDICE …….. OTHERS……..

PER ABDOMEN

DISTENSION…….. LIVER DULLNESS ……..

GUARDING ……..

TENDERNESS ……. BOWEL SOUNDs……..

FREE FLUID ……..

ORGANOMEGALLY ……..

Signature of Candidate **Signature of Supervisor**

OTHER SYSTEMS

CVS...

CNS.....

RS .....

OTHERS.....

INVESTIGATIONS :(ON ADMISSION)

HB: .... TLC COUNT .... PLATELET COUNT.....

RFT.....

LFT.....

CHEST X RAY.....

ABDOMINAL X RAY .....

ECG .....

PTI/INR.....

VIRAL MARKER.....

WIDAL.....

PROVISIONAL DIAGNOSIS

INTRA OP FINDINGS

SITE ..... NUMBER .....

SIZE OF INVOLVED SEGMENT OF ILEUM.....

PERITONEAL FLUID.....

POST OP (INVESTIGATIONS):

BLOOD C/S .....

PERITONEAL FLUID C/S.....

HISTO PATHOLOGICAL EXAMINATION .....

DIAGNOSIS

Signature of Candidate

Signature of Supervisor

OPERATIVE DETAILS

PROCEDURE DONE .....

SUTURE MATERIAL.....

DURATION OF SURGERY .....

CLOSURE.....

POST OP

FEEDING START ..... DRAIN REMOVAL.....

ANTIBIOTICS ..... DURATION.....

BLOOD TRANSFUSION .....

PROTEIN SUPPLEMENTATION.....

AMINO ACID TRANSFUSION ..... OTHERS.....

COMPLICATIONS

GENERAL COMPLICATIONS : PULMONARY / RENAL / THROMBOSIS /

TOXEMIA / OTHER .....

POST OP COLLECTION ..... WOUND INFECTION .....

WOUND DEHISCENCE .....

FECAL FISTULA..... REOPERATION .....

CONDITION ON DISCHARGE :.....

FINAL OUT COME :.....

FOLLOW UP:.....

IF DEATH ,TIME AND CAUSE.....

Signature of Candidate **Signature of Supervisor**

KEY TO MASTER CHART

ICJ	-	ILEO-CAECAL JUNCTION
HTN	-	HYPERTENSION
TB	-	TUBERCULOSIS
LOOP ILEOS	-	LOOP ILEOSTOMY
RESECTION- ANAS	-	RESECTION AND ANASTMOSIS
ABD PAIN	-	ABDOMINAL PAIN

S No	NAME	MRD	Age	Gender	Abd pain	Constipation	Distension	Fever	Vomiting	Time of presentation
1	KK	1269434	43	F	Present	Present	Present	Present	Absent	Late
2	AS	1195762	42	M	Present	Present	Present	Present	Present	Early
3	VK	1208993	46	M	Present	Present	Present	Present	Absent	Early
4	SS	1174705	46	M	Present	Present	Present	Absent	Present	Late
5	SC	622832	49	M	Present	Absent	Present	Present	Absent	Early
6	SS	1086056	48	M	Present	Present	Present	Absent	Present	Early
7	R	1226389	48	M	Present	Present	Present	Present	Absent	Late
8	NR	755368	46	M	Present	Absent	Present	Present	Present	Early
9	SS	1233743	43	M	Present	Present	Present	Present	Present	Early
10	AS	1227464	52	M	Present	Present	Present	Absent	Absent	Late
11	AG	1240334	51	F	Present	Absent	Present	Present	Present	Early
12	GS	1266879	46	M	Present	Present	Present	Present	Absent	Early
13	S	1266788	46	M	Present	Absent	Present	Present	Present	Early
14	B	1268160	48	F	Present	Present	Present	Absent	Absent	Early
15	MK	1271720	28	F	Present	Present	Present	Present	Present	Early
16	JS	1287371	38	M	Present	Present	Present	Present	Present	Early
17	A	1280904	37	M	Present	Present	Present	Present	Absent	Early
18	R	1282292	30	M	Present	Present	Present	Absent	Present	Early
19	SK	1286298	22	M	Present	Present	Present	Present	Absent	Late
20	C	1285451	36	M	Present	Present	Present	Present	Present	Early
21	J	1288941	36	M	Present	Present	Present	Present	Present	Early
22	AM	1127632	34	M	Present	Present	Present	Absent	Absent	Early
23	JS	1288786	62	M	Present	Present	Present	Present	Present	Early
24	KS	1290934	34	M	Present	Present	Present	Present	Absent	Early
25	O	1288320	64	M	Present	Present	Present	Absent	Absent	Early
26	HS	1300277	62	M	Present	Present	Present	Present	Absent	Late
27	SK	1256811	30	M	Present	Present	Present	Present	Absent	Early
28	AK	1288850	19	M	Present	Present	Present	Absent	Present	Early
29	IK	1210541	70	F	Present	Present	Present	Present	Present	Early
30	V	1208993	45	M	Present	Present	Present	Present	Absent	Early
31	HK	1309725	23	F	Present	Present	Present	Absent	Present	Late
32	V	1311115	18	F	Present	Absent	Present	Present	Absent	Early
33	J	1312468	64	F	Present	Present	Present	Absent	Present	Early
34	TS	1325276	65	M	Present	Present	Present	Present	Present	Early
35	R	1172812	42	F	Present	Present	Present	Present	Absent	Late
36	RM	1323343	19	M	Present	Present	Present	Absent	Present	Early
37	MS	1322790	29	M	Present	Present	Present	Present	Absent	Early
38	RK	1316209	40	F	Present	Present	Present	Present	Present	Early
39	HK	1325426	40	F	Present	Present	Present	Absent	Absent	Early
40	KR	1321767	30	M	Present	Present	Present	Present	Present	Late
41	SK	1342145	33	F	Present	Present	Present	Present	Absent	Early
42	VB	1300241	50	M	Present	Absent	Present	Absent	Present	Early
43	JK	1323933	60	F	Present	Present	Present	Present	Absent	Early
44	SK	1337590	34	M	Present	Present	Present	Present	Present	Early
45	SS	1333425	34	M	Present	Present	Present	Present	Present	Late
46	MK	1227624	40	M	Present	Present	Present	Present	Absent	Early
47	PS	1334323	40	M	Present	Present	Present	Present	Present	Late
48	DK	1346313	45	M	Present	Present	Present	Absent	Absent	Early
49	SK	1342145	33	F	Present	Present	Present	Present	Present	Late
50	SB	1323966	42	M	Present	Present	Present	Absent	Present	Early
51	YK	1321872	58	M	Present	Absent	Present	Present	Absent	Early
52	JS	993266	56	M	Present	Present	Present	Present	Present	Early
53	BS	1287417	54	M	Present	Present	Present	Present	Absent	Early
54	AK	1274084	56	F	Present	Present	Present	Absent	Present	Early
55	JK	1239765	20	F	Present	Present	Present	Present	Absent	Late
56	S	1372292	55	M	Present	Present	Present	Present	Present	Early
57	R	1371468	53	M	Present	Present	Present	Present	Present	Early
58	BK	1382004	48	F	Present	Present	Present	Absent	Absent	Late
59	BS	1383850	50	M	Present	Present	Present	Present	Absent	Early
60	DL	1318475	50	M	Present	Absent	Present	Present	Absent	Early

S No	Perforations	Location from ICJ	Diabetes	HTN	Etiology	Treatment	Complications	Mortality
1	Single	Less than 10	Absent	Absent	Non-specific	Loop ileos	Absent	Present
2	Single	10 to 30	Absent	Present	Non-specific	Loop ileos	Absent	Present
3	Single	Less than 10	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
4	Single	10 to 30	Absent	Absent	Non-specific	Resection-anas	Absent	Present
5	Single	10 to 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
6	Single	Less than 10	Absent	Present	TB	Resection-anas	Anast leak	Absent
7	Single	More than 30	Absent	Present	Non-specific	Loop ileos	Absent	Present
8	Single	10 to 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
9	Multiple	Multiple	Absent	Absent	Typhoid	Simple closure	Absent	Absent
10	Single	Less than 10	Present	Absent	TB	Loop ileos	Absent	Absent
11	Single	More than 30	Absent	Absent	Typhoid	Loop ileos	Woud infection	Absent
12	Single	10 to 30	Absent	Absent	Non-specific	Resection-anas	Woud infection	Absent
13	Single	More than 30	Present	Absent	Typhoid	Loop ileos	Faecal fistula	Absent
14	Single	10 to 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
15	Single	Less than 10	Absent	Absent	TB	Loop ileos	Absent	Absent
16	Multiple	Multiple	Absent	Absent	Typhoid	Resection-anas	Absent	Absent
17	Single	10 to 30	Absent	Absent	Non-specific	Loop ileos	Absent	Absent
18	Single	10 to 30	Absent	Absent	Typhoid	Resection-anas	Absent	Absent
19	Single	Less than 10	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
20	Single	10 to 30	Absent	Absent	TB	Loop ileos	Woud infection	Absent
21	Single	10 to 30	Present	Absent	Traumatic	Simple closure	Absent	Absent
22	Multiple	Multiple	Absent	Absent	Traumatic	Resection-anas	Woud infection	Absent
23	Single	Less than 10	Absent	Absent	Non-specific	Simple closure	Woud infection	Absent
24	Single	More than 30	Absent	Present	TB	Loop ileos	Absent	Absent
25	Single	10 to 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
26	Single	More than 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
27	Single	Less than 10	Absent	Present	Typhoid	Resection-anas	Absent	Absent
28	Single	More than 30	Absent	Absent	TB	Simple closure	Absent	Absent
29	Multiple	Multiple	Absent	Absent	Typhoid	Simple closure	Faecal fistula	Absent
30	Single	10 to 30	Absent	Absent	Non-specific	Loop ileos	Absent	Absent
31	Single	More than 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
32	Single	Less than 10	Absent	Absent	TB	Loop ileos	Woud infection	Absent
33	Single	10 to 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
34	Multiple	Multiple	Absent	Absent	Traumatic	Simple closure	Absent	Absent
35	Single	More than 30	Absent	Absent	TB	Loop ileos	Absent	Absent
36	Single	10 to 30	Absent	Absent	Non-specific	Loop ileos	Faecal fistula	Absent
37	Multiple	Multiple	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
38	Multiple	Multiple	Absent	Absent	TB	Loop ileos	Intra-abd abscess	Absent
39	Single	More than 30	Absent	Absent	Typhoid	Resection-anas	Absent	Absent
40	Single	Less than 10	Absent	Absent	Traumatic	Resection-anas	Absent	Absent
41	Multiple	Multiple	Absent	Absent	TB	Loop ileos	Faecal fistula	Absent
42	Multiple	Multiple	Absent	Absent	Typhoid	Resection-anas	Faecal fistula	Absent
43	Single	10 to 30	Absent	Absent	Traumatic	Loop ileos	Absent	Absent
44	Single	More than 30	Absent	Absent	TB	Loop ileos	Absent	Absent
45	Multiple	Multiple	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
46	Multiple	Multiple	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
47	Single	More than 30	Absent	Absent	Traumatic	Resection-anas	Absent	Absent
48	Single	10 to 30	Absent	Absent	TB	Loop ileos	Absent	Absent
49	Multiple	Multiple	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
50	Single	More than 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
51	Single	10 to 30	Absent	Absent	Traumatic	Resection-anas	Woud infection	Absent
52	Single	More than 30	Absent	Absent	Typhoid	Simple closure	Absent	Absent
53	Multiple	Multiple	Absent	Absent	Traumatic	Resection-anas	Absent	Absent
54	Single	10 to 30	Absent	Absent	Typhoid	Loop ileos	Absent	Absent
55	Single	More than 30	Absent	Absent	Typhoid	Resection-anas	Anast leak	Absent
56	Multiple	Multiple	Absent	Absent	Typhoid	Loop ileos	Woud infection	Absent
57	Single	10 to 30	Absent	Absent	Traumatic	Resection-anas	Absent	Absent
58	Multiple	Multiple	Absent	Absent	Typhoid	Simple closure	Absent	Absent
59	Single	10 to 30	Absent	Absent	Typhoid	Simple closure	Absent	Absent
60	Single	More than 30	Absent	Absent	Traumatic	Resection-anas	Absent	Absent

Phone
Tele/Fax
Email Examinations@bfu

No. BFUHS/2K21p-TH/ 126

Date 5/1/22

The Principal,
DMC, Ludhiana.

Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 29.10.2021 has approved the plan of thesis of **Deepak Kumar**, a student of your college for **MS General Surgery** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
To study the pattern and outcome of the ileal perforations.

Supervisor
Dr. Chiranjiv Singh Gill
Prof.,
Dept. of Surgery,
DMCH, Ludhiana.

Co-Supervisor

Dr. Ravinder Pal Singh
Prof.,
Dept. of Surgery,
DMCH, Ludhiana.

The student has to submit the four copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

123. If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.

124. The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.

TO STUDY THE PATTERN AND OUTCOME OF THE ILEAL PERFORATIONS

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SURGERY

IN

GENERAL SURGERY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

MARCH 2021

DR. DEEPAK KUMAR

DEPARTMENT OF GENERAL SURGERY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	TO STUDY THE PATTERN AND OUTCOME OF THE ILEAL PERFORATIONS.
For the degree of	M.S. (GENERAL SURGERY)
Name of the candidate	Dr. DEEPAK KUMAR
Supervisor	Dr. Chiranjiv Singh Gill, Professor, Surgery, Department of Surgery, DMC&H Ludhiana
Co-supervisor	Dr. Ravinder Pal Singh, Professor, Department of Surgery, DMC&H Ludhiana
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

INTRODUCTION: Ileal perforation peritonitis is a frequently encountered surgical emergency in the developing countries.
Despite the availability of modern diagnostic facilities and advances in treatment regimes, this disease has an abrupt onset and a rapid downhill course with a high mortality.

AIMS AND OBJECTIVES OF THE STUDY: To evaluate the mortality and morbidity in patients with ileal perforation peritonitis.

MATERIALS AND METHODS: The prospective study will be conduct in the department of surgery in Dayanand Medical College and Hospital in Ludhiana the study will include patients with diagnosis of ileal perforation peritonitis.

Clinical Significance: Access the outcome of mortality and morbidities in ileal perforations peritonitis.

Keywords: ileal perforation peritonitis, exploratory laparotomy

(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled "TO STUDY THE PATTERN AND OUTCOME OF THE ILEAL PERFORATIONS." exist in the Department of General Surgery, DMC&H, Ludhiana and will be provided to be candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate himself under our supervision and guidance.

Supervisor

Dr. Chiranjiv Singh Gill
Professor
Department of Surgery
DMCH, Ludhiana

Co-Supervisor

Dr. Ravinder pal Singh
Professor
Department of Surgery
DMCH, Ludhiana

HEAD OF DEPARTMENT

Dr. Jaspal Singh
Professor and Head
Department of Surgery
DMCH, Ludhiana

Place: DMCH

Date: 03/04/2021

APPROVAL PROFORMA
BY RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	Dr. Deepak Kumar
Department	General Surgery
Topic of Thesis	TO STUDY THE PATTERN AND OUTCOME OF ILEAL PERFORATIONS .
Likely date of appearing in PG examination	MAY 2023
Date of enrollment	25 July 2020
Name of Head of Department	Dr. Jaspal Singh
1) Supervisor **2) Co-Supervisor**	Dr. Chiranjiv Singh Gill Dr. Ravinder pal Singh
Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
Dr. Harpreet Kaur (Professor & Head, Pathology)	Mr. R K Sharma (Legal Expert)
Dr. Jaspal Singh (Professor & Head, Surgery)	Dr. Ramit Mahajan (Associate Professor, Gastroenterology)
Dr. Dinesh Gupta (Professor & Head, Medicine)	Dr. Anu Sharma (Professor, Anatomy)
Dr. Sandeep Kaushal (Dean Academics & Professor & Head, Pharmacology)	Dr. Sandeep Kaushal (Dean Academics & Professor & Head, Pharmacology)
Dr. Gurpreet S Wander (Vice Principal)	Dr. Gurpreet S Wander (Vice Principal & Professor & Head, Cardiology)
	Dr. Gagandeep Singh (Secretary, Ethics Committee Professor & Head, Neurology)

Approved: Yes / No

Dr. Sandeep Puri
Chairperson
Research Committee

Approved: Yes / ~~No~~

Prof. Arvind Malhotra
Chairperson
Ethics Committee

BABA FARID UNIVERSITY OF HEALTH SCIENCES, FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

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2	NAME OF THE INSTITUTE	Dayanand Medical College & Hospital, Ludhiana
3	COURSE OF STUDY AND SUBJECT	M.S. GENERAL SURGERY
4	DATE OF ADMISSION OF COURSE	25 JULY2020
5	TITLE OF THE TOPIC	TO STUDY THE PATTERN OUT COME OF ILEALPERFORATIONS

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Perforation of terminal ileum is a cause for obscure peritonitis, heralded by exacerbation of abdominal pain associated with tenderness, rigidity and guarding, most pronounced over right iliac fossa. Ileal perforation peritonitis is a frequentlyencountered surgical emergency in the tropical countries and low socio economic countries due to high incidence of enteric fever and tuberculosis

It is reported to constitute the fifth common cause of abdominal emergencies due to high incidence of enteric fever and tuberculosis in these regions.[1,2].

Typhoid Is the most common cause for this dreaded complication while tuberculosis, trauma, and malignant enteritis follow close suit.

The incidence of perforation in typhoid fever has been reported to be 0.8% to 18%. Tuberculosis accounts for 5–9% of all small intestinal perforations in India and it is the second commonest cause after typhoid fever**[3]**

The methods of source control for ileal perforations include primary closure, resection, and anastomosis of small gut or diverting stoma, depending on the site and number of perforations, severity of peritonitis, and general condition of the patient. Thereafter, the patient is managed with antibiotics and continued postoperative care**[4]**.The choice of a procedure for source control depends on the patient condition as well as the surgeon preference.

Gastrointestinal perforations have been surgical problem since the time immortal.

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Various operative procedures were advocated by different authors, such as the following:

(i) simple primary repair of perforation[5].

(ii) repair of perforation with ileotransverse colostomy[6].

(iii) primary ileostomy[7].

(iv) single layer repair with an omental patch[8]

(v) resection and anastomosis [9]

The aim of the present study is to evaluate the outcome of various surgical interventions and factors a/w with mortality and morbidities in ileal perforations peritonitis in tertiary care center.

Majority of the patient presents with the sudden onset of abdominal pain a high index of suspicion is essential to diagnose hollow viscus perforation early as significant mortality and morbidities results from diagnostic delay.

Surgery play important role in management of perforation evaluation and management of gastrointestinal perforations provide some the most challenging experience for the surgeon with advent of new technology.

Despite the availability of modern diagnostic facilities and advances in treatment regimes, this disease has an abrupt onset and a rapid downhill course with a high mortality if not treated[10]

6.2 REVIEW OF LITERATURE

Free perforation is a rare complication of Crohn's disease. Seven cases were found in a total series of 360 in Birmingham. It occurs during an acute exacerbation of chronic disease, particularly in the presence of distal obstruction. The incidence of this complication may becoming less common and steroid therapy was not a precipitating factor. Primary resection of the perforated and distal obstructed bowel is likely to give the best results.[11]

Seventy-eight patients ranging from four to 65 years of age were treated for typhoid perforation of the bowel. Sixty-one patients (78%) were males. The average time from perforation to admission was 56 hours. The mortality rate was 32% and was adversely influenced by the duration of illness, duration of perforation, shock, uremia, encephalopathy and fecal peritonitis. Forty-nine patients were treated by closure of the perforation, resection or miscellaneous procedures; the other 29 by closure of the perforation combined with an end-to-end ileotransverse colostomy. Although mortality was the same in both groups, those undergoing bypass had a significantly smoother postoperative course. [12]

In the study conducted the commonest cause of Enteric fever was non-specific ileal perforations. Perforations occurred in second week after onset of fever with mean of 10.5 days. Perforation commonly occurred in second and third decade of life with 48% of patients between ages 11-30. Male preponderance with male to female ratio 5:1 was observed. Pneumoperitoneum in chest and erect abdominal X-Ray was seen in 84% of the patients. Time between onset of pain and surgical intervention (Lag Period) was between 10 to 96 hours with mean of 43.44 hours. Single Ileal perforation was seen in 84% of the cases with 72% of the perforations being located within 30 cm from IC junction. Majority of the perforations were located within 60 cms from ICJ (96%).[13]

Mortality was more in primary closure group with 21.42% (6 patients) and mortality was less in ileostomy group with 7.14% (2 patients). This

study proposes that ileostomy may be given priority over other surgical options in moribund patients. [14]

47 patients with 62 major injuries to the bowel and mesentery due to blunt abdominal trauma were reviewed. The male to female ratio was 8.4: 1 and the average age was 34.98 years. There were 44 injuries to the small intestine including 1 duodenal injury, 11 colonic injuries and 7 injuries to the mesentry. 26 patients were injured in road traffic accidents. Out of 29 patients with intestinal perforation, free peritoneal air was present on plain abdominal and chest radiography in 23 patients. 18 patients underwent laparotomy on the basis of clinical findings alone. The commonest injury was a perforation at the antimesentric border of the small bowel. Treatment consisted of simple closure of the perforation, resection and anastomosis and repair followed by protective colostomy for colonic perforations. 3 (6.38%) deaths were recorded, while 8 (17.02%) patients developed major complications. [15]

Agarwal S, One hundred and thirteen specimens of Ileum received over the last 3 years (1990-92) were reviewed histologically and analysed to determine the aetiology of perforation. Perforations were seen in all age groups varying from one month to 75 years with a peak incidence during 3rd and 4th decades. Males were more frequently affected. Perforations were single or multiple involving the whole ileum. The highest incidence (52) was seen in enteric fever. Next in frequency (19) was tuberculosis. In 23 cases no specific aetiology could be identified. [16]

They suffered primary blast injuries, which resulted in isolated perforations of the terminal ileum. They were operated at different times after the blast event. The resected specimens were examined under light microscopy. One patient was operated immediately, and had three perforations in the terminal ileum. In the other two patients, abdominal complaints appeared only 24 and 48 hours later. These two patients were found to have hematomas in the wall of the terminal ileum, and small perforations therein, with almost no contamination of

the peritoneal cavity. On histological examination, there were small perforations with disruption of all intestinal layers.[17]

Chatterjee H, et al, 2001, Two hundred and forty eight cases of proved typhoid ileal perforation were admitted and treated in three phases in the department of surgery during 1966-1998. Of these, 71% patients belonged to second and third decades of life. Male female ratio was 4:1. Abdominal pain (100%) fever (95%) and constipation (87%) were the main presenting symptoms. Abdominal guarding and rigidity (84%) were the principal physical signs. Plain radiograph of abdomen showed evidence of pneumoperitoneum in 57% of cases. The Widal test was positive for S. typhi in 74% of cases. Blood and bone marrow culture were positive for S. typhi in 9% and 30% respectively. Histology of the excised edges of perforation confirmed typhoid pathology in 62% of specimens. [18]

Pain abdomen was the most common presenting symptom in small bowel perforation followed by vomiting, abdominal distension, fever and constipation. X-ray erect abdomen, USG abdomen and CECT abdomen in selected cases are very useful investigations for diagnosis of small bowel perforation.The most common cause of small bowel perforation was Ileal perforation. [19]

Rauf A Wani et al, 2006, There were 79 cases of nontraumatic terminal ileal perforation; the causes for perforation were enteric fever (62%), nonspecific inflammation(26%), obstruction(6%), tuberculosis(4%) and radiation enteritis (1%)[20]

Steven T. Edino et al, 2007, The morbidity was 49.1% and the most common postoperative complications included wound infection, wound dehiscence, burst abdomen, residual intra-abdominal abscesses and enterocutaneous fistula. Mortality was 15.1% and was significantly affected by multiple perforations, severe peritoneal contamination and burst abdomen (p value <0.05, odds ratio >1)[21]

Aba F Uba et al, 2007, The incidence peaked in April-May, and November-December. Increased incidence of typhoid perforation was observed between 2002 and 2005. All patients presented with the

classic features of typhoid enteric perforation. Hypokalaemia and anaemia were common at presentation. [22]

Dasgupta A et al, 2009,Tuberculous enteritis was found to be present in 49 of the 56 patients (87.5%) (ileum being the site most commonly affected), while nodal involvement was seen in 39 (69.6%) patients. Perforations were present in 39 out of 49 (79.6%) intestinal tissues; most being solitary and ileum was the commonest site. [23]

Aksharma et al 2013 Despite various measures such as safe drinking water supply and safe disposal of waste, intestinal perforation from salmonellosis remains the most common emergency surgery performed. [24]

SedighehTehmasebi et al,2013, The gastrointestinal tract is a common site for localization of opportunistic microorganisms in AIDS. However, surgical abdominal emergencies such as intestinal perforation resulted from tuberculosis are uncommon in these patients. The asymptomatic occurrence of such intestinal perforation has not been reported our knowledge. We represent an HIV and HCV co-infected man with miliary tuberculosis and an incidentally detected free air under diaphragm in the chest X-ray eventually resulting in exploratory laparotomy which then revealed two tubercular-induced intestinal perforations. [25]

6.3 AIMS AND OBJECTIVES OF THE STUDY

To evaluate the mortality and morbidity in patient with ileal perforation peritonitis.

7.0 MATERIALS AND METHODS

The study will be conducted among the patients admitted to the emergency with ileal perforation peritonitis of the Dayanand Medical college and hospital ,Ludhiana

7.1 SOURCE OF DATA

The study will be conducted among the patients admitted to the emergency with ileal perforation peritonitis of the Dayanand Medical college and hospital ,Ludhiana.

7.2 METHOD OF COLLECTION OF DATA

Inclusion Criterion:1) Age >18 year and <70 years2) Either gender

Exclusion Criterion: 1) Age < 18 years and > 70 years2)Psychatric ill patient.3)Radiation enteritis

Duration of Study/ Number of Cases: 50 cases

Outcome:Acces the outcome of mortality and morbidity in ileal perforations peritonitis coming in DMC AND HOSPITAL.

(Name of the method in plan): (1) simple primary repair of perforation (2) primary ileostomy(3) resection and anastomosis

Statistical Analysis:

The data will be recorded and frequency distribution will be made and descriptive analysis will be done, chi square / fischer exact test will be used for association.P value of less than 0.05 will be significant.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

Patients presenting included in the study will have toundergo hematological, biochemical or radiological investigations as per protocol. For this patient included in the study will be informed regarding their inclusion and written informed consent will be taken for all patients included in the study.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Yes

LIST OF REFERENCES

1 Siddiqui S. Epidemiologic patterns and control strategies in typhoid fever. Journal of the Pakistan Medical Association. 1991;41:143–6

2 Chalya PL, MabulaJB, Koy M. Typhoid intestinal perforations at a University teaching hospital in Northwestern Tanzania: a surgical experience of 104 cases in a resource-limited setting. World Journal of Emergency Surgery.2012;7:4.

3 KapoorVK. Abdominal tuberculosis: the Indian contribution," Indian Journal of Gastroenterology.1998;17:141–7.

4 Bashir M, Nadeem T, Iqbal J, Rashid A. Ileostomy in typhoid perforation. Annals of King Edward Medical College. 2003;9:221–5.

5 Bhansali SK. Gastrointestinal perforations. A clinical study of 96 cases. Journal of Postgraduate Medicine. 1967;13:1–12

6 Prasad PB, Choudhury DK, Prakash O. Typhoid perforation treated by closure and proximal side-to-side ileo-transverse colostomy. Journal of the Indian Medical Association. 1975;65:297–9.

7 Kaul BK. Operative management of typhoid perforation in children. International Surgery. 1975;60:407–10.

8 Purohit PG. Surgical treatment of typhoid perforation. Experience of 1976 Sangli epidemic. Indian Journal of Surgery. 1978;40:227–38.

9 Athie CG, Guizar CB, Alcantara AV, AlcarazGH, MontalvoEJ. Twenty-five years of experience in the surgical treatment of perforation of the ileum caused by Salmonella typhi at the General Hospital of Mexico City, Mexico. Surgery. 1998;123:632–6.

10 Pal DK. Evaluation of best surgical procedures in typhoid perforation—an experience of 60 cases. Tropical Doctor. 1998;28:16–8

11 SteinbergDM, Cooke TW, Williams AJ. Free perforation in Crohn's disease. Gut. 1973;14:187-90.

12 Eggleston FC, Santoshi B, Singh CM. Typhoid Perforation of Bowel. Ann Surg. 1979;190:31-5.
13 Ray P, Gupta HN, Roy M,Samhita S. Indian Science Academy. N. K.Gossain and Co. (Pvt.) Ltd.; 1980.
14 Kala RP, Asopa HS, Mathur SK, Arti SP. Resection and Ileotransverse colostomy for enteric perforation of terminal ileum. Ind J Surg, 1978;40:674-8
15 Koul R, Malik MS. Blunt abdominal trauma with intestinal injury. Ind J Surg. 1987;221-4.
16 Agarwal S, Gera N. Tuberculosis--an underestimated cause of ileal perforation. J Indian Med Assoc. 1996;94:341-52
17 Paran H, Neufeld D, Shwartz I, Kidron D, Susmallian S, Mayo A, et al. Perforation of the terminal ileum induced by blast injury: delayed diagnosis or delayed perforation? J Trauma. 1996;40:472-5.
18 Chatterjee H, Jagdish S, Pai D, Satish N, Jayadev D, Reddy PS. Changing trends in outcome of typhoid ileal perforations over three decades in Pondicherry. Trop Gastroenterol. 2001;22:155-8.
19 Scott R,Townsend JMjr.Trauma sabiston text book of surgery; 2004.
20 Wani RA, ParrayFQ, Bhat NA, Wani MA, Bhat TH, Farzana F. Nontraumatic terminal ileal perforation. World J Emerg Surg. 2006;1:7.
21 Uba AF, ChirdanLB, Ituen AM, Mohammed AM. Typhoid intestinal perforation in children: a continuing scourge in a developing country. PediatrSurg Int. 2007;23:33-9.
22 Edino ST, Yakubu AA, Mohammed AZ, Abubakar IS. Prognostic factors in typhoid ileal perforation: a prospective study of 53 cases. J Natl Med Assoc. 2007;99:1042-5.
23 Dasgupta A, Singh N, Bhatia A. Abdominal tuberculosis: a histopathological study with special reference to intestinal perforation and mesenteric vasculopathy. J Lab Physicians. 2009;1:56-61.

24 Sharma A, Sharma R, Sharma S, Sharma A, Soni D. Typhoid intestinal perforation: 24 perforations in one patient. Ann Med Health Sci Res. 2013;3:S41-3

25 Tahmasebi S, Moslemi S, Tahamtan M, Taheri L, Davarpanah MA. Asymptomatic Tuberculosis-Induced Ileal Perforation in an HIV- Infected Individual; A Case Report. Bull Emerg Trauma. 2013;1:182-5.

PROFORMA

SR. NO. ……..

MRD NO. :…….

NAME: …….. AGE: ……..

SEX: ……..

ADDRESS……..

DOA …….. DOD……..

STAY: ……..

HISTORY

CHIEF COMPLAINTS ……..

SYMPTOMS ….. PRESENT/ABSENT …. DURATION ……

ABDOMINAL PAIN……..

FEVER……..

VOMITING……..

CONSTIPATION……..

LOOSE STOOLS……..

OTHERS……..

Signature of Candidate **Signature of Supervisor**

PAST HISTORY

DIABETES MELLITUS……..

TUBERCULOSIS……..

HYPERTENSION…….

HISTORY OF ANY SURGERY……..

EXAMINATION

PR …….. BP……..

RR……..

TEMP…….. HYDRATION ……..

PALLOR……..

JAUNDICE …….. OTHERS……..

PER ABDOMEN

DISTENSION…….. LIVER DULLNESS ……..

GUARDING ……..

TENDERNESS ……. BOWEL SOUNDs……..

FREE FLUID ……..

ORGANOMEGALLY ……..

Signature of Candidate **Signature of Supervisor**

OTHER SYSTEMS

CVS...

CNS.....

RS .....

OTHERS.....

INVESTIGATIONS :(ON ADMISSION)

HB: .... TLC COUNT .... PLATELET COUNT.....

RFT.....

LFT.....

CHEST X RAY.....

ABDOMINAL X RAY .....

ECG .....

PTI/INR.....

VIRAL MARKER.....

WIDAL.....

PROVISIONAL DIAGNOSIS

INTRA OP FINDINGS

SITE ..... NUMBER .....

SIZE OF INVOLVED SEGMENT OF ILEUM.....

PERITONEAL FLUID.....

POST OP (INVESTIGATIONS):

BLOOD C/S .....

PERITONEAL FLUID C/S.....

HISTO PATHOLOGICAL EXAMINATION .....

DIAGNOSIS

Signature of Candidate

Signature of Supervisor

OPERATIVE DETAILS

PROCEDURE DONE .....

SUTURE MATERIAL.....

DURATION OF SURGERY .....

CLOSURE.....

POST OP

FEEDING START ..... DRAIN REMOVAL.....

ANTIBIOTICS ..... DURATION.....

BLOOD TRANSFUSION .....

PROTEIN SUPPLEMENTATION.....

AMINO ACID TRANSFUSION ..... OTHERS.....

COMPLICATIONS

GENERAL COMPLICATIONS : PULMONARY / RENAL / THROMBOSIS /

TOXEMIA / OTHER .....

POST OP COLLECTION ..... WOUND INFECTION .....

WOUND DEHISCENCE .....

FECAL FISTULA..... REOPERATION .....

CONDITION ON DISCHARGE :.....

FINAL OUT COME :.....

FOLLOW UP:.....

IF DEATH ,TIME AND CAUSE.....

Signature of Candidate **Signature of Supervisor**

INFORMED PATIENT CONSENT

Date: _____

I……..D/o, W/o, S/o……
……am willing to participate in the study **"TO STUDY THE PATTERN AND OUTCOME OF ILEAL PERFORATIONS"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

……. ……
Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य "**TO STUDY THE PATTERN AND OUTCOME OF ILEAL PERFORATIONS"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

“TO STUDY THE PATTERN AND OUTCOME OF THE ILEAL PERFORATIONS.” ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ